Annual Report
2017-2018

Collaborative Expertise for Innovative Solutions

mmri.ubc.ca

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SUMMARY & HIGHLIGHTS

- **July 1, 2017**: The Director appointed by the VPR, UBC Okanagan.
- **September 1, 2017**: Institute website launched; hiring process of the institute staff began.
- **January 1, 2018**: The MMRI Research Engineer joined the institute.
- **January 29, 2018**: The MMRI Administrative Assistant joined the institute.
- **February-April, 2018**: Multiple meetings held between the MMRI Director and Department Heads and Leads of other major initiatives at UBC as related to materials and manufacturing clusters to harmonize the institute’s activities and ensure its bi-campus collaboration mechanism.
- **May 24, 2018**: MMRI Research Cluster Leads appointed on both campuses, as well as Lead for a cross-disciplinary Design-for-Industry 4.0 research and training initiative at UBC.
- **June 1, 2018**: The Management Committee formally formed and met in July.
- **June 6, 2018**: Formal call for profile submissions announced, for both original and new members.
- **40** profiles collected from academic members (UBC and external) towards building a comprehensive people-expertise-facility matchmaking database.
- **27** companies approached MMRI since July 2017 to initiate university-industry collaborative projects.
- **10** collaboration opportunities facilitated between faculty members in different disciplines and universities.
- **$5,935,036** received by academic members as research grants.
- **13** team-based multidisciplinary proposals coordinated by MMRI.
- **173** peer-reviewed articles published by MMRI members.
- **8** events organized/sponsored to promote the institute and identify potential new opportunities for partnership.
- **A Contribution to Organizations (CTO)** funding approved by the National Research Council-Industrial Research Assistance Program (NRC-IRAP) for MMRI to provide multidisciplinary technical services in materials and manufacturing to SMEs in B.C.
- **Accelerate Okanagan’s** blog series on Advanced Manufacturing initiated and managed by MMRI.
- **Member success stories** continually promoted on UBC as well as major external media outlets.
GOALS

Materials and Manufacturing Research Institute (MMRI) is a multidisciplinary, interdepartmental research hub at the University of British Columbia (UBC) fostering collaboration between local, national and international R&D sectors.

Mission: The mission of MMRI is to build on existing strengths of UBC on materials and manufacturing research and create new opportunities for multidisciplinary research in related emerging areas through shared knowledge and network-based funding.

Vision: MMRI will be a role model to link ‘core’ and ‘applied’ science and contribute to knowledge advancement in multidisciplinary research areas of advanced materials and manufacturing through close partnership between faculty at the University of British Columbia and other sectors of academia, industry and government organizations, and by world-class training of students and scientists, and dissemination of high-quality research.

Research Strategy: Today’s global research in the areas of advanced materials and manufacturing is all about making value-added products that are smarter, more durable, and more energy-efficient. New materials with improved multi-functional (e.g. mechanical, thermal, electrical, chemical, and biological) properties are being researched as key enablers for major industrial innovations and for the competitiveness of enterprises across the entire technological spectra. At the same time, innovations in manufacturing methods are being pursued to enhance the quality of products through new material processing technologies, while minimizing environmental impact and manufacturing costs. Once integrated optimally, advanced materials and manufacturing research significantly contribute to the economic prosperity and social well-being of industrial regions and countries.

A key challenge in the above ‘materials’ and ‘manufacturing’ integration, however, is that the processing technologies and manufacturing standards can vary rapidly and widely for a given material category and from one target application to another. As an example, the same light and yet very strong fiberglass composite material can and (economically) should be designed and manufactured differently when it is used in a relatively small mechanical component, versus in a large building structure against earthquake damage. As another example, the fabrication method and dispersion levels applied during manufacturing of nano-scale electromagnetic devices in biomedical applications must be quite different than those intended for aerospace structures under lightening risk.

As such, in order to maximize the efficiency and applicability of materials research projects in the real manufacturing world, it is strongly believed that the structure of a new research institute should be of multidisciplinary nature and based on an ‘application-based’ strategy, rather than the traditionally accepted ‘material-type’ based strategy. This is the working principle of our institute.
Structure: MMRI currently hosts five pillars/clusters with participating researchers from engineering, chemistry, physics, biology, medicine, health and exercise, computer science, social science, applied mathematics, and management disciplines. These clusters include:

- Aerospace and Transportation Materials and Manufacturing (ATMM)
- Biomedical and Biological Materials and Manufacturing (BBMM)
- Building and Construction Materials and Manufacturing (BCMM)
- Electromagnetic and Nanoscale Materials and Manufacturing (ENMM)
- Polymer and Natural Materials and Manufacturing (PNMM)

Under each cluster, we have one dedicated Lead from the Point Grey campus and one dedicated Lead from the Okanagan campus who direct and coordinate the cluster activities. The institute is also currently in the process of adding a sixth cluster specifically around applied data analytics and socioeconomic impact analysis for large-scale materials and manufacturing initiatives.

Leadership Team:
Governance: MMRI Director is appointed by, and reports to the Vice-Principal Research (VPR), UBC Okanagan, and he/she assumes the overall leadership, strategic development, and organizational responsibility of the institute. The Management Committee team assists the Director to manage the day to day activities of MMRI. The MMRI Management Committee members are appointed by the Director. Co-leads of the Research Clusters of the institute are formal, voting members of the Committee, in addition to Director as the Committee Chair. When a Cross-Disciplinary Initiative is launched at the institute, its Chief Development Officer also becomes a voting member of the Committee. MMRI administrative and research staff are part of the Committee and serve as non-voting members. Guest members, e.g. Research Associates of the Cluster co-Leads, are invited to the committee as needed. The management team last met in July 2018. MMRI is also in the process of forming a steering committee composed of senior industry representatives as well as pertinent faculty Deans.

Membership: MMRI accepts two types of membership: Academic members and Industry members, from UBC and external organizations. A formal Membership Definition and Benefits document was prepared by the management team in 2018, explaining the structure of MMRI, inviting academic and industry members to join the institute and outlining the benefits they can gain through this membership. This document can be found in Appendix I. To join the institute, academic and industry professionals have been asked to fill out and submit their Profiles using accessible templates at MMRI website. We have thus far mostly focused on university researchers to promote MMRI membership which have results in more than 40 profile submission, including national and international members. Initially, over 80 members had signed for MMRI’s proposal to Senate and their formal profiles are being processed and posted on the MMRI website as received. Samples of the academic and industry member profiles can be found in Appendix II. The call-for-membership is distributed to new faculty members approximately every three months.

Space/facilities: Since January 2018, the institute’s administrative office has been officially located in EME 2131 on UBC Okanagan campus. The hub is shared with UBC STAR staff, which has brought new networking and joint initiatives between MMRI and STAR.

The institute has recently acquired a lab-scale “micro-injection molding system” (namely a HAAKE MiniJet Pro Piston Injection molding System from Thermo Scientific), which significantly benefits the collaborative research activities of the members in the areas of bio-polymer and bio-composite engineering, specifically under the PNMM and BCMM clusters.

MMRI has started building a mechanism to facilitate and manage the process of sharing lab equipment and research tools among its members. We have also initiated discussions with other facilities on both campuses including AMPEL, STAR, SIF, CRN, etc. to develop a practical system for this purpose.

Staff and administration: MMRI currently has two full-time dedicated staff. The institute Research Engineer, Dr. Mahdi Takaffoli, has numerous academic and industry experiences in diverse areas of mechanical engineering and materials science. Before joining MMRI, he was a postdoctoral fellow at the Massachusetts Institute of Technology (MIT) in the United States. The MMRI Administrative Assistant, Ms. Jolene Campbell, has significant experience in project management and administrative works. We are currently in the process of developing a new Work-Study position for UBC students to e.g. assist with graphic design and extension of promotional activities of the institute.
ACADEMIC MEASURES

As a newly established institute, MMRI has recently initiated an on-line mechanism to keep track of the research activities of its members. While this is an ongoing project for the institute, the academic record reported in this section is based on the statistics gathered so far from the members.

Grants

<table>
<thead>
<tr>
<th>Name</th>
<th>Cluster</th>
<th>Faculty</th>
<th>$ Amt Grants/Contracts Received</th>
<th>Major Grants/Contracts</th>
</tr>
</thead>
<tbody>
<tr>
<td>Andrew Jirasek</td>
<td>ENMM</td>
<td>IKBSAS</td>
<td>$220,000</td>
<td>UBCO Eminence Foundation; NSERC DG</td>
</tr>
<tr>
<td>Jake Bobowski</td>
<td>ENMM</td>
<td>Arts and Sciences</td>
<td>$2,000</td>
<td>National Instruments Academic Research Grant</td>
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<tr>
<td>Mohammad Arjmand</td>
<td>PNMM</td>
<td>Applied Science</td>
<td>$150,000</td>
<td>Start-up and other University grants</td>
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<tr>
<td>Sepideh Pakpour</td>
<td>BBMM</td>
<td>Applied Science</td>
<td>$120,000</td>
<td>Start-up and other University grants</td>
</tr>
<tr>
<td>Kenneth Chau</td>
<td>ENMM</td>
<td>School of Engineering</td>
<td>$70,339</td>
<td>NSERC Discovery; NSERC RTI</td>
</tr>
<tr>
<td>Ben Hall Chew</td>
<td>BBMM</td>
<td>Medicine</td>
<td>$256,000</td>
<td>Prospective Trial; An EDGE Consortium Clinical Trial; Boston Scientific Investigator Initiated trial</td>
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<tr>
<td>Michael Deyholos</td>
<td>PNMM</td>
<td>IKBSAS</td>
<td>$200,000</td>
<td>Genome Canada GAPP; Mitacs; NSERC Discovery</td>
</tr>
<tr>
<td>Warren Hare</td>
<td>BCMM</td>
<td>IKBSAS</td>
<td>$80,000</td>
<td>MITACS Accelerate</td>
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<tr>
<td>Name</td>
<td>Faculty</td>
<td>Department/Program</td>
<td>Funding</td>
<td>Sources</td>
</tr>
<tr>
<td>--------------------</td>
<td>---------</td>
<td>-----------------------------</td>
<td>-----------</td>
<td>-------------------------------------------------------------------------</td>
</tr>
<tr>
<td>York Hsiang</td>
<td>ENMM</td>
<td>Surgery</td>
<td>$671,870</td>
<td>CIHR – NSERC; Vancouver Coastal Health</td>
</tr>
<tr>
<td>Lorne Whitehead</td>
<td>ENMM</td>
<td>Physics and Astronomy</td>
<td>$1,629,700</td>
<td>Alfred P. Sloan Foundation; NRC; BCIC Ignite Fund</td>
</tr>
<tr>
<td>Abbas Milani</td>
<td>ATMM</td>
<td>School of Engineering</td>
<td>$764,411</td>
<td>Mitacs Accelerate; NSERC (Connect Grants-Level 2); Ryde Holdings; NRC-IRAP CtO program</td>
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<tr>
<td>Kevin Golovin</td>
<td>PNMM</td>
<td>Applied Science</td>
<td>$162,760</td>
<td>NSERC Discovery Grant</td>
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<tr>
<td>Jian Liu</td>
<td>ENMM</td>
<td>Applied Science</td>
<td>$314,000</td>
<td>CFI; BCKDF; NSERC Discovery Grant</td>
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<tr>
<td>Jeffrey Andrews</td>
<td>ENMM</td>
<td>IKBSAS</td>
<td>$200,000</td>
<td>NSERC Discovery Grant; UBC Okanagan Eminence Fund</td>
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<tr>
<td>Lukas Bichler</td>
<td>ATMM</td>
<td>School of Engineering</td>
<td>$970,956</td>
<td>NSERC SPG; Mitacs Accelerate</td>
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<tr>
<td>Hadi Mohammadi</td>
<td>BBMM</td>
<td>School of Engineering</td>
<td>$123,000</td>
<td>NSERC ENGAGE; NSERC CRD; School of Engineering Research Tools</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td></td>
<td><strong>$5,935,036.00</strong></td>
<td></td>
</tr>
</tbody>
</table>
## Publications

The total number of publications by MMRI members in 2017-2018 has been 173. Below is a list of sample major publications under each cluster.

<table>
<thead>
<tr>
<th>Cluster</th>
<th>Publication</th>
</tr>
</thead>
</table>


2) C. Audet and W. Hare. Derivative-free and Blackbox Optimization. Springer International Publishing AG, Switzerland, 2017.


PNMM


## Current Grad Student Supervision Samples

<table>
<thead>
<tr>
<th>Cluster</th>
<th># Grad Students Supervised/Co-Supervised</th>
<th>Supervisor/Co-Supervisor</th>
</tr>
</thead>
<tbody>
<tr>
<td>ATMM</td>
<td>26</td>
<td>Lukas Bichler</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Abbas Milani</td>
</tr>
<tr>
<td>BBMM</td>
<td>3</td>
<td>Ben Hall Chew</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Sepideh Pakpour</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Hadi Mohammadi</td>
</tr>
<tr>
<td>BCMM</td>
<td>7</td>
<td>Warren Hare</td>
</tr>
<tr>
<td>ENMM</td>
<td>11</td>
<td>Andrew Jirasek</td>
</tr>
<tr>
<td></td>
<td></td>
<td>York Hsiang</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Lorne Whitehead</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Jeffrey Andrews</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Jian Liu</td>
</tr>
<tr>
<td>PNMM</td>
<td>4</td>
<td>Michael Deyholos</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Kevin Golovin</td>
</tr>
<tr>
<td>Total</td>
<td>81</td>
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</tr>
</tbody>
</table>

## Graduated Trainees/Alumni

<table>
<thead>
<tr>
<th>Cluster</th>
<th>Alumni Name</th>
<th>Degree</th>
<th>Finish Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>ENMM</td>
<td>Nam Musterer</td>
<td>PHAS</td>
<td>2018</td>
</tr>
<tr>
<td></td>
<td>Reily Blackner</td>
<td>PHAS</td>
<td>2017</td>
</tr>
<tr>
<td></td>
<td>Kiera van der Sande</td>
<td>PHAS</td>
<td>2017</td>
</tr>
<tr>
<td></td>
<td>Mohammed Al Shaks</td>
<td>PhD</td>
<td>2017</td>
</tr>
<tr>
<td>Name</td>
<td>Degree/Title</td>
<td>Year</td>
<td></td>
</tr>
<tr>
<td>-----------------------</td>
<td>-------------------------------</td>
<td>------</td>
<td></td>
</tr>
<tr>
<td>Wilhelm Wenngren</td>
<td>MASc</td>
<td>2017</td>
<td></td>
</tr>
<tr>
<td>Peter Ott</td>
<td>Heilbronn University</td>
<td>2018</td>
<td></td>
</tr>
<tr>
<td>ATMM</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lucas Delaby</td>
<td>Visiting MASc</td>
<td>2018</td>
<td></td>
</tr>
<tr>
<td>Mathew Smith</td>
<td>PhD</td>
<td>2017</td>
<td></td>
</tr>
<tr>
<td>Chinmaya Thakore</td>
<td>M.Eng.</td>
<td>2017</td>
<td></td>
</tr>
<tr>
<td>Anil Prasad</td>
<td>MASc</td>
<td>2017</td>
<td></td>
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<tr>
<td>Cyril Phillipose</td>
<td>M.Eng</td>
<td>2017</td>
<td></td>
</tr>
<tr>
<td>Somi Doja</td>
<td>MASc</td>
<td>2017</td>
<td></td>
</tr>
<tr>
<td>Antonia Ciocoiu</td>
<td>BASc (Research Assistant)</td>
<td>2018</td>
<td></td>
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<tr>
<td>Sri Rajagopal</td>
<td>BASc (Research Assistant)</td>
<td>2017</td>
<td></td>
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<tr>
<td>Samuel Burke</td>
<td>BASc (Research Assistant)</td>
<td>2017</td>
<td></td>
</tr>
<tr>
<td>Masoud Haghi Kashani</td>
<td>PhD</td>
<td>2017</td>
<td></td>
</tr>
<tr>
<td>Hossein Montazerian</td>
<td>MASc</td>
<td>2017</td>
<td></td>
</tr>
<tr>
<td>Ronak Vahed</td>
<td>MASc</td>
<td>2017</td>
<td></td>
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<tr>
<td>Milad Ramezankhani</td>
<td>MASc</td>
<td>2017</td>
<td></td>
</tr>
<tr>
<td>Safat Rashif</td>
<td>MASc</td>
<td>2017</td>
<td></td>
</tr>
<tr>
<td>BBMM</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Masoumi, M Mehdi</td>
<td>MASc</td>
<td>2018</td>
<td></td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td><strong>21</strong></td>
<td></td>
</tr>
</tbody>
</table>
Sample student/alumni success stories

**Peter O’Brien** is a wearable-technology entrepreneur and co-founder of the VO2 Master, the world’s first Bluetooth oxygen-sensing device for endurance athletes. Maximal oxygen uptake—VO2 max—is an indicator of an athlete’s cardiovascular fitness and aerobic endurance. Results are typically monitored in a clinical setting, under strict protocols, and miles away from an athlete’s natural training environment on the road, trail or track. Conventional VO2 analyzers are big, bulky and expensive. They weigh at least five pounds (2.3 kg), are the size of a breadbox, and cost upwards of $10,000. Under the supervision of Dr. Ken Chau under ENMM cluster and with grant support from the Natural Sciences and Engineering Research Council of Canada (NSERC) and the National Research Council of Canada’s (NRC) Industrial Research Assistance Program (IRAP), O’Brien began during his education in the School of Engineering working with a group of undergraduate and master’s level co-op students to design a hardware solution for his innovative idea to measure VO2 max.

**Luke Ohlmann**, an MASc student in Dr. Hadi Mohamamdi’s Heart Valve Performance Laboratory (HVPL) under BBMM cluster, designed and fabricated the world’s first active prosthetic heart valve, pioneering the incorporation of soft robotics into the design of mechanical heart valves for which a US patent is pending. In March 2018 the team behind this ground breaking global innovation was invited to present their findings at the prestigious 2018 World Congress of Biomechanics in Dublin. The presentation focused on the ability of the valve to overcome the major hemodynamic complications that tend to arise when designing particularly small bioprosthetic valves.

**Masoud Haghi Kashani** from UBC Okanagan in partnership with another graduating PhD student at UBC Vancouver launched a spin-off company in Vancouver area, called Vision Composite Inc designing and implementing a novel manufacturing process for producing cost-effective, high-quality Transparent Glass Fiber-Reinforced Polymer (GFRP) composite parts. The company works closely with the major composite sectors in B.C. with an estimated development investment value of $6M. Masoud completed his PhD under the supervision of Dr. Abbas Milani in the ATMM cluster. He received a 2017 Graduate Dean’s Thesis Fellowship and his numerical models on aerospace composites received international awards, including the best material model developer award by the American Society for Composites.
ACTIVITIES AND PROJECTS

Website: The MMRI website was developed over the past year and constantly maintained and updated by the MMRI staff. The website aims at providing a channel for our members to promote their success stories and featured publications and get informed of the upcoming events as well as funding opportunities.

Members profiles database: With a pivotal goal of coalescing expertise across disciplines, MMRI welcomes all the stakeholders in materials and manufacturing sectors to engage with the institute and take advantage of its platform for researching collaboratively, exchanging knowledge, and amplifying impact on the society.

MMRI constantly strives to integrate new partners from academia and industry into its structure. We are building an online searchable database of our members’ profiles which will offer a valuable tool for people, expertise and research infrastructure matchmaking and initiating new collaborative works. This is as an ongoing project for the MMRI administrative team and to date we have received 40 research profiles.

Invited speaker series held:

- Laser material processing for improving biocompatibility of implants
  - Dr. Nazanin Mirhosseini, University of Manchester, United Kingdom
  - July 31, 2018, UBC Okanagan

- Tools and models for a predictive simulation of composite forming processes
  - Dr. Nahiene Hamila, INSA Lyon
  - July 31, 2018, UBC Okanagan

- Industry 4.0 – communication is key
  - Dipl.-Inf. Florian Krebs, The German Aerospace Center (DLR)
  - September 22, 2017, UBC Okanagan
UBC Design for Industry 4.0 (DFI4) Workshop and Chair Initiative:

Dr. Homayoun Najjaran (as Chair) and Dr. Abbas Milani (as co-Chair) organized and hosted the 1st UBC Industry 4.0 School & Industry Night on February 18 and 19, 2018, Kelowna, B.C. Following the success of Concordia’s 2017 CIADI and CAM Industry 4.0 Summer School, this Winter School brought together over 80 key stakeholders including students, researchers and industry delegates. Industry 4.0 today is increasingly being heralded by the world’s leading industrialized countries as the fourth industrial revolution. This two-day workshop, along with an industry night networking event, was planned with a main focus on promoting industry-university research collaboration at UBC in the emerging Industry 4.0 design and manufacturing areas. The event included invited talks by senior industry delegates from large-scale, advanced manufacturing sectors nationally and internationally; who have already established a strong R&D vision and programs to innovate the ‘Factories of the Future’. In addition to sharing their cutting-edge knowledge to the attendees from SMEs, faculty and students, the presentations and subsequent government-led discussion forums brought multiple interactive discussions to identify current challenges toward the world of industrial automation and digitization, as well as new collaborative project opportunities that can collectively benefit the advancement of Industry 4.0 in Canada and beyond. FESTO Canada conducted two hands-on student workshop sessions during the event (i4.ubc.ca).

Currently, Drs. Najjaran and Milani are working with a wide range of faculties from Engineering, Management, Social Science, Computer Science as well as industries to possibly establish a Chair in Design for Industry 4.0 (DFI4) as a new university-wide effort towards this cross-disciplinary research and training program.

Snapshots of the recent Industry 4.0 School and Industry Night Event held at UBC Okanagan including a hands-on workshop for students, offered by Festo Canada (Feb 2018).
Team-based research grant proposal support

BiRNet, Bioinnovative Renewables Network

- MMRI coordinated 2 LOIs:
  - Revealing novel potentials of bio-based products for a circular bioeconomy
  - Natural fiber composites with enhanced weathering properties for outdoor applications
- Involved UBC faculty members: Drs. Deyholos (Biology), Eskicioglu (Eng.), Evans (Forestry), Hewage (Eng.), Klironomos (Biology), Ko (Materials), Milani (Eng.), Pakpour (Eng.), Zandberg (Chemistry)
- Requested funding: $358,000 for two years

NRC-IRAP, Contributions to Organizations

- MMRI submitted 1 proposal:
  - Providing multidisciplinary technical services in materials and manufacturing to SMEs in British Columbia
- Preliminary approval has been received.
- Potential see funding opportunity for all MMRI researchers
- Total project cost: $250,000 estimated for year 1

Innovative Solutions Canada (ISC) Challenges

- MMRI coordinated 4 proposals.
  - Advanced coatings for PPE: PRE Labs (Kelowna) partnering with Dr. Golovin (Eng.); Requested funding: $50k for 6 months (total project cost: $150k)
  - AM for impact mitigation: Mosaic (Toronto) partnering with Dr. Arjmand (Eng.); Requested funding: $40k for 6 months (total project cost: $200k)
  - AM for tissue simulants: 3D Currax (Kelowna) partnering with Drs. Kim and Golovin (Eng.); Requested funding: $60k for 6 months (total project cost: $200k)
  - Corrosion detection and prevention: Powertech Labs (Vancouver) partnering with Drs. Liu (Eng.) and Jelovica (Mech.); Requested funding: $50k for 6 months (total project cost: $200k)

IDEaS Competitive Projects

- MMRI Collaborated with UBC STAR and supported proposal preparation and team building
- MMRI was directly involved with 3 proposals.
  - Lightweight ballistic protection: Helios Global Technologies (Kelowna) and Epic Ventures (Victoria) + Drs. DiLabio (Chemistry) and Wulff (Chemistry-Uvic)
- Chemical, biological and radiological hazard detection and planning: Drs. Golovin, Liu, Pakpour, and Zarifi (Eng.)
- What is in that full motion video: TerraSense (Vernon) + Dr. Liu (Eng.)

**IDEaS Innovation Networks**
- MMRI collaborated with UBS STAR to prepare the LOI.
  - Advanced materials for physical protection
- The members of the proposed Micro-net include:
  2 industry partners: Helios Global Technologies (Kelowna) and Epic Ventures (Victoria)
  6 UBC faculty members: Drs. DiLabio, Milani, Vaziri, Ko, Bacca and Elfring
  2 University of Victoria faculty member: Drs. Wulff and Brolo
  1 University of Alberta faculty member: Dr. Hogan
- Requested funding: $1,500,000 (total project cost: $3,000,000)

**UBCO & UBCV Collaborative Research Mobility Award**
- MMRI coordinated one proposal.
  - Collaborative Research toward Embracing the 4th Industrial Revolution
- Involved faculty members: Dr. Homayoun Najjaran and Dr. Abbas Milani
- Requested funding: $10,000

**Alberta Innovate: Alberta Bio Future, Opportunities**
- MMRI coordinated one LOI
  - A multi-criteria analysis approach to optimum production of fly ash-based hybrid biocomposites for fire resistant applications
- The project team include:
  6 UBC faculty members: Drs. Milani, Deyholos, Ko, Mehrkhodavandi, DiLabio, Pakpour
  3 University of Alberta faculty members: Drs. Ayranci, Curtis, McDermott
  1 Northern Alberta Institute of Technology faculty member: Dr. Paolo Mussoni
  2 international faculty members: Drs. Zhidong Han (Harbin University of Science and Technology, China) and Joseph Allen (Harvard University, USA)
  1 industry partner: BioComposites Group, AB
- Total project cost: $1,042,000
Expertise matchmaking between faculty members: MMRI plans to be a reference point of contact when faculty members are looking for an expertise/facility/industry partner that is not available to them in their own departments or network of researchers. Whereas with the development of our Profile Database, faculty members can take advantage of its platform to identify the researcher or industry partner who can support their needs, the MMRI staff is committed to always remain as a match-maker when approached by a faculty member or spontaneously when a potential partnership is identified through their networking activities.

Some examples of these match-making activities are listed below:

- Boris Stoeber (UBCV, Mechanical) to David Perrin (UBC, Chemistry)
  - In response to Dr. Perrin’s request to find a researcher who can address his microfluidic device fabrication needs

- Kevin Golovin (UBCO, Engineering) to Liisa Holsti (UBCV, Medicine)
  - In response to Dr. Holsti’s request to work with a researcher who can develop new synthetic skin-like materials.

- Sabrina Leslie (McGill U, Physic) to Isaac Li (UBCO, Chemistry)
  - Alignment of research interests

- Lope Tabil (Saskatchewan U, Chemical Engineering) to Abbas Milani (UBCO, Engineering)
  - A potential collaborator in bio-based composite research activities initiated at Dr. Milani’s lab

- Philip Evans (UBCV, Forestry) to Abbas Milani (UBCO, Engineering)
  - A collaborator in bio-based composite research activities initiated at Dr. Milani’s lab

- Mattia Bacca (UBCV, Mechanical) to Gino DiLabio (UBCO, Chemistry)
  - In response to Dr. DiLabio’s request to build a team who can support the research goals of the proposal submitted to the IDEaS Micro-net program

- Gwynn Elfring (UBCV, Mechanical) to Gino DiLabio (UBCO, Chemistry)
  - In response to Dr. DiLabio’s request to build a team who can support the research goals of the proposal submitted to the IDEaS Micro-net program

- Jasmin Jelovica (UBCV, Mechanical) to Zheng Liu (UBCO, Engineering)
  - In response to Dr. Liu’s request to find a collaborator who can contribute to a proposal on corrosion detection in naval platforms

- Zhidong Han (Harbin University of Science and Technology, China) to Abbas Milani (UBCO, Engineering)
  - In response to Dr. Milani’s request to identify a researcher with expertise in fire-resistant polymers who can contribute to his Alberta Innovate proposal on fly ash-based composites

- Robert Godin (Chemistry, UBCO) to Ian Fould (Engineering, UBCO)
  - In response to Dr. Godin’s request on availability of a number of lab equipment on UBC campus beneficial to his research plan
COMMUNITY OUTREACH AND COMMUNICATIONS

Industry outreach and support: MMRI has been constantly responding to the requests of companies approaching the institute to find best researchers who can address their technical challenges. Furthermore, the institute’s staff has been looking for industry partners that fit into a Call for Proposal, encouraging them to partner with the institute’s academic members to collaboratively submit a proposal.

A list of example companies connected to MMRI is given below:

- Canadian Industrial Hemp Corporation, Toronto, ON: A Mitacs proposal might result from the discussion currently happening between the company and a UBCO faculty member.
- LlamaZOO, Vancouver, BC: MMRI has established connection with the company for the future activities of the institute in Industry 4.0 or potential joint proposals in virtual/augmented reality.
- Mosaic Manufacturing, Toronto, ON: A collaborative proposal was submitted to ISC Challenge program with Mosaic to be the Lead Applicant and two UBC affiliates as subcontractors.
- 3D Currax, Kelowna, BC: A collaborative proposal was submitted to ISC Challenge program with Currax 3D to be the Lead Applicant and three UBC affiliates as subcontractors.
- Powertech Labs, Vancouver, BC: A collaborative proposal was submitted to ISC Challenge program with Powertech Labs to be the Lead Applicant and three UBC affiliates as subcontractors.
- Global Heat Transfer, Edmonton, AB: Discussion is ongoing with the company to initiate collaborative projects. As UBC could not support their specific metal 3D-printing, MMRI introduced the company to another collaborating research institute at the University of New Brunswick that has the requested facility.
- LionGate Technologies, Victoria, BC: Connection was established for a potential joint proposal in future in the area of health technologies.
- Telops, Quebec City, QC: Connection was established for a potential joint proposal in future in the area of photonics.
- CSI Domes Inc, Kelowna, BC: Discussion is ongoing to submit a Mitacs proposal in collaboration with a UBCO faculty member.
• TerraSense Analytics, Vernon, BC: MMRI made the connection between the company and a UBCO faculty member which led to a joint proposal for IDEaS Competitive Projects.

• CIMA, Kelowna, BC: Connection was established to evaluate potential areas of collaboration.

• Pela, Saskatoon, Saskatchewan: MMRI has made the connection between the company and various faculty members at UBCO. Discussion to plan a Mitacs proposal is ongoing.

• PDJ & Associates, Kelowna, BC: Connection was made between the company and a UBCO faculty member who can support their technical requests.

• CRAiLAR, Victoria, BC: Larson Consulting Group: connection was established to involve the company in future activities of MMRI academic members in the area of bio-based composites.

• Spexi, Vancouver, BC: Connection was made between the company and a faculty member at UBCV whose research interests are aligned with the focus of the company.

• Open Green Building Society, Vancouver, BC: Connection was made between the company and a faculty member at UBCO because of the alignment of interests.

• PRE Labs, Kelowna, BC: MMRI made the connection between the company and a faculty member at UBCO which initially led to a joint ISC Challenge proposal and continued to other joint proposals for IDEaS program.

• Hydrogen in Motion, Vancouver, BC: Connection was made between the company and a faculty member at UBCO.

• XCo Tech Inc, Penticton, BC: MMRI introduced to the company a faculty member at UBCV whose expertise can benefit the company’s product development.

• Helios Global Technologies, Kelowna, BC: MMRI supported planning and preparation of two proposals in which the company was a partner.

• Lumiant Corporation, Kelowna, BC: Connection was established to initiate joint proposals in future in the area of advanced ceramics.

• IPMC Smart Technologies Inc., Kelowna, BC: Joint meeting between the company’s CEO and related faculty members was organized by MMRI to discuss potential joint activities.

• Embrace Orthopaedics, Vancouver, BC: The startup company, located at UBC HATCH, was connected to a faculty member at University of Waterloo whose research expertise might benefit the company’s product development plan.

• Pathonix Sports, Vancouver, BC: Connection was made with this startup company, located at UBC HATCH, to initiate joint proposals in future in the area of wearable electronics.
**Event attendance:** MMRI staff and management team members have attended several events in 2018 specifically with the goals of promoting the institute and identifying potential collaborators in academia and industry.

A list of these events are as follows:

- BCTECH Summit, May 14-16, 2018, Vancouver
- International Pacific Rim Hemp Conference, July 18-19, 2018, Vancouver
- International Research Roundtable on Printing the Future of Therapeutics in 3D (PFT3D), June 10-12, 2018, Vancouver
- Canada Gas & LNG Exhibition & Conference, May 14-16, 2018, Vancouver
- First Annual UBC Industry 4.0 School and Industry Night, February 18-19, 2018, Kelowna
- DRDC-CSS and UBC STAR Joint Symposium, Defence and Security Innovation Opportunity Driving Regional Development: Sustaining the Transition from Procurement to Partnership, June 25-26, 2018, UBC’s Okanagan campus, Kelowna BC
- Visit to Northwestern Polytechnical University, China, July 2018
- Sustainability Leadership Council of the Okanagan, July 26, 2018, Kelowna
- Innovation Showcase, August 1, 2018, UBC Okanagan

**Media Communications:** To build a stronger connection with local professional communities and promote the activities of our researchers, the MMRI Research Engineer is collaborating with Accelerate Okanagan as a #OKGNtech columnist on their website. One blog post has been written so far under Advanced Manufacturing News:

- Advanced Manufacturing Vol 1: A glance at enablers of advanced manufacturing (June 1, 2018)
**Partnership activities with other UBC institutes/centers:** MMRI is committed to avoid acting in silo and disconnected from other institutes at UBC. The management team has been actively reaching out to various institutes, research centers and key figures on both campuses to identify synergistic collaborative opportunities.

Some of these internal reach out activities has been summarized below:

- **Institute for Computing, Information and Cognitive Systems (ICICS):** MMRI was in communication with Dr. Robert Rohling, Director, and Craig Wilson, Communication Writer, to identify researchers who can support IDEaS call for proposal. The institute has also established connection with Dr. John Madden, Director of AMPEL, as well as DR. Adam Fraser, Bionics@UBC Network Coordinator.

- **Enterprenurship@UBC:** MMRI is working with Camille Saltman, Director UBC Okanagan, and Blair Simonite, Program Director to ensure its resources and connection can be leveraged to support the activities of startup companies connected with UBC.

- **Data Science Institute (DSI):** Discussion has been initiated between MMRI Director, Dr. Abbas Milani, and DSI Scientific Director, Dr. Raymond T. NG, to identify areas of collaboration and potentially add a new Research Cluster in MMRI focused on data analytics.

- **UBC Survive and Thrive Applied Research (STAR):** MMRI is collaborating with Dr. Keith Culver, Director, and Kent Dehnel, Operations Facilitator, when opportunities in defence, security, and human-centered areas demand support from expertise in materials science and manufacturing technologies.

**Partnership activities with external institutes and organizations:** Beyond UBC, MMRI has been seeking strategic partnership with national and international organizations to ensure the institute’s effective operation towards reaching its goals of fostering multi-disciplinary research and providing technical services to firms across Canada and globally.

MMRI currently has practical collaboration with the following organizations:

- NRC IRAP ITAs in Kelowna and Vancouver
- Mitacs Canada in Kelowna and Vancouver
- Centre for Advanced Materials and Related Technology (CAMTEC), University of Victoria, BC
- Institute of Machine Tools and Control Engineering at Technische Universität Dresden, Dresden, Germany

MMRI has also initiated discussion with the following organizations to establish continues partnership:

- Marine Additive Manufacturing Centre of Excellence at the University of New Brunswick
- MAKE+ at British Columbia Institute of Technology (BCIT)
- Material Matters Research Center, Emily Carr University of Art + Design
- Composites Innovation Center, Winnipeg, MB
GOALS FOR NEXT ACADEMIC YEAR

- **Provide networking opportunities for members:** MMRI plans to organize its first series of workshops (a five-day event concurrently in Kelowna and Vancouver) in December 2018 where members under each cluster will briefly present their research activities and major research plans, while meeting other members from both campuses as well as the external members (video-conferencing facility will be provided).

- **Initiate and manage the NRC IRAP seed funding:** MMRI will officially announce this approved program in September 2018 and will manage the program until its completion by March 2019. A highly multi-disciplinary set of phase-I projects with partnership of B.C. based SMEs will emerge from this program, with the goal of extending them to larger/long term projects via other funding mechanisms such as NESERC CRD and MITACS Accelerate.

- **Continue support for team-based proposals and awarded grants:** MMRI will remain committed to facilitate planning, team building and writing multidisciplinary proposals for different funding programs such as Eminence, IDEaS, NSERC CRD, NSERC SPG, CFI Innovation, among others. For the awarded grants, MMRI will continue to provide assistance in coordination of project activities at different labs/campuses/organizations as well as assistance in administrative organization and reporting efforts.

- **Organize training programs for graduate students:** MMRI plans to organize summer graduate courses with invited international instructors. Furthermore, a funding request for a new training program on Industry 4.0 will be coordinated next year.

- **Maintain regular communication with members:** MMRI will initiate a monthly email newsletter in Fall 2018.

- **Participate in organizing national/international conferences:** In partnership with the Composites Research Network (CRN), MMRI will be the lead organizer of the 11th Canadian-International conference on Composite Materials, CANCOM 2019, to be held at UBC Okanagan Campus next July. In addition, the Design-for-Industry 4.0 team is planning to hold the 2nd UBC Industry 4.0 School and Industry Night Event parallel to the CANCOM2019 (e.g. under a new theme called Composites 4.0), hence bringing a wider range of audience from academia and industry to attend these two interrelated events. Given its subject relevance, this event is also expected to highly promote the Learning Factory Initiative at UBC.

- **Offer systematic expertise/facility matchmaking:** MMRI will establish its online tool to facilitate people expertise/facilities (academia and industry) matchmaking.
CONTACT INFORMATION

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APPENDIX I: MEMBERSHIP DEFINITION AND BENEFITS

RE: Director’s Message and Invitation

Dear Colleagues,

The Materials and Manufacturing Research Institute (MMRI) has been launched at the University of British Columbia (UBC) as a multidisciplinary and interdepartmental research hub fostering collaboration between researchers from the two campuses of UBC, as well as linkage with local, national and international industrial sectors for large-scale collaborative R&D initiatives. MMRI currently hosts five pillars/clusters with over 100 participating researchers from engineering, chemistry, physics, biology, medicine, health and exercise, computer science, social science, applied mathematics, and management disciplines. These clusters include:

- Aerospace and Transportation Materials and Manufacturing (ATMM)
- Biomedical and Biological Materials and Manufacturing (BBMM)
- Building and Construction Materials and Manufacturing (BCMM)
- Electromagnetic and Nanoscale Materials and Manufacturing (ENMM)
- Polymer and Natural Materials and Manufacturing (PNMM)

Under each cluster, we have one dedicated Lead from the Point Grey campus and one dedicated Lead from the Okanagan campus who direct and coordinate the cluster activities. The institute is also currently in the process of adding a sixth cluster specifically around applied data analytics and socioeconomic impact analysis for materials and manufacturing initiatives.

Hereby I cordially invite new faculty and industry members to join our teams under their primary cluster of interest by filling the membership form at: https://mmri.ubc.ca/help-us-foster-collaboration. Your profile will be part of an extensive database that we are building as a match-making tool for the upcoming call for proposals and connecting people, expertise and facilities.

Hereby I wish to take this opportunity and also thank each and every one of our existing members who have provided tremendous support from the launching point of the institute to working closely with the management team over the past year to initiate multiple team-based grant opportunities. Undoubtedly, with your leadership in the projects and world-class expertise and experience in pertinent research areas of materials and manufacturing, this truly multidisciplinary institute can be made a role model in Canada by systematically linking basic and applied sciences and arriving at large-scale initiatives and impactful innovations for communities around us. I strongly believe collaborative expertise will be a key towards this success, not only between researchers within each cluster, but also between clusters as well as other institutes and partners.

Finally, on behalf of the management team and all members, I would like to acknowledge the UBC senior administrators who have put a considerable amount of excitement and support into our joint initiatives across the clusters.

Sincerely,

Abbas S. Milani, Ph.D., P.Eng.
Director - MMRI
Professor of Mechanical Engineering

..Please see the Membership Benefits next page..
MMRI Membership Definition

Faculty members and industry delegates who have submitted and received the approval of their MMRI Research Profile (link below) are considered to be the formal members of the institute and will benefit from the following activities:

- Involve in large-scale grant applications as PI or co-PI as coordinated by the institute clusters.
- Receive support from the institute research staff, including grant writing and network facilitation with academia and industry at large, as well as administrative assistance including grant reporting and event organization.
- Receive calls for participation in the currently funded projects by industry and government.
- Be invited to the networking and workshop events aimed at building widespread connection between MMRI researchers from the two campuses of UBC, industry partners, and government organizations.
- Access to the facility of other research members with a minimal service fee as agreed in that lab.
- Access MMRI’s shared computational/software tools; for use by faculty and students.
- Engage in multidisciplinary collaboration opportunities with external academic and industrial members (national and international) to join new or ongoing multi-institutional projects.
- Access to MMRI online matchmaking service to identify the required people, expertise, and facility for your new projects/program initiatives.
- Obtain assistance in promotion and publication of your research successes stories.
- Access to the past successful team-based LOIs and grant applications by the senior members.

For more information, please visit: https://mmri.ubc.ca

Membership form: https://mmri.ubc.ca/help-us-foster-collaboration
APPENDIX II: SAMPLE RESEARCH PROFILES

Andrew Jirasek

Associate Professor
Physics, UBC Okanagan
Phone: 250-807-9597  Email: Andrew.jirasek@ubc.ca
http://medicalphysics.ok.ubc.ca/faculty/jirasek.html

Research Theme
Biomedical and Biological Materials and Manufacturing (BBMM)

Research Areas
- Raman spectroscopy of irradiated biological materials
- Three dimensional radiation dosimetry using radiosensitive polymer gel materials

Research Facilities/Tools
- Raman microscope, 632/785nm laser excitation
- Basic wet lab polymer gel manufacturing instrumentation
- Access to ionizing radiation equipment at BC Cancer
- Access to CT imaging at BC Cancer

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HYTEC - Kohler Canada Co.

Armstrong, BC
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R&D Theme of Interest
Polymer and Natural Materials and Manufacturing

Types of Products/Services
• Hytec, a division of Kohler Canada Co., is a full-line manufacturer of gelcoat and acrylic bathtubs, showers, bath/showers, modular bathing systems and shower receptors.

Infrastructure
• Gelcoat and Resin Spray Equipment
• Thermoformer
• Drill, Trim and Grind Cell
• CNC machine