



THE UNIVERSITY OF BRITISH COLUMBIA

Materials & Manufacturing Research Institute

Annual Report 2017-2018

**Collaborative Expertise for
Innovative Solutions**





SUMMARY AND HIGHLIGHTS

- **July 1, 2017:** The Director, Dr. Abbas Milani, 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 joined the institute.
- **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
- **July 12, 2018:** First meeting of the Management Committee held.
- **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 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** prompted on both 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.

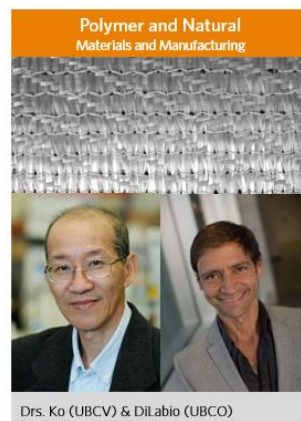
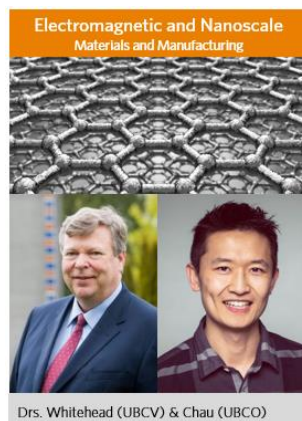
OPERATIONS

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.

Management 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 activities of MMRI. The MMRI Management Committee is made up of individuals appointed by the MMRI Director as Chair of the Committee. Co-leads of the Research Clusters of the institute are voting members of the Committee, in addition to the Chair. When a Cross-Disciplinary Initiative is launched at the institute, its Chief Development Officer, appointed by the Director, 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, may be invited to the committee as needed. The management team last met in May 2018. MMRI is also in the process of forming a steering committee composed of senior industry delegates and pertinent faculty Deans.

Membership: MMRI accepts two type of membership: Academic members and Industry members, both 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. Samples of the academic and industry member profiles can be found in Appendix II. The call-for-membership is widely distributed for new faculty members approximately every three months.

Space/facilities: Since January 2018, the institute has been officially located in EME 2131 on UBC Okanagan campus. The office space is shared with UBC STAR staff. This has also resulted in a number of 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 also plans to build a mechanism to facilitate and manage the process of sharing lab equipment and research tools among its members. We have thus initiated discussions with other facilities on both campuses including individual faculty labs, 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’s 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). The MMRI Administrative Assistant, Ms. Jolene Campbell, has significant experience in project management and administrative works. We are also in the process of developing a new Work-Study position for a UBC student position to further assist the institute with graphic design and promotional material development activities.



ACADEMIC MEASURES

As a newly established institute, MMRI has recently initiated a 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

Member Name	Cluster	Faculty	\$ Amt Received	Major Grants/Contracts
Andrew Jirasek	ENMM	IKBSAS	\$220,000	UBCO Eminence; NSERC DG
Jake Bobowski	ENMM	Arts and Sciences	\$2,000	National Instruments Academic Research Grant
Mohammad Arjmand	PNMM	Applied Science	\$150,000	Start-up and other University grants
Sepideh Pakpour	BBMM	Applied Science	\$120,000	Start-up and other University grants
Kenneth Chau	ENMM	Engineering	\$70,339	NSERC Discovery; NSERC RTI
Ben Hall Chew	BBMM	Medicine	\$256,000	Prospective Trial; An EDGE Consortium Clinical Trial; Boston Scientific Investigator Initiated trial
Michael Deyholos	PNMM	IKBSAS	\$200,000	Genome Canada GAPP; Mitacs; NSERC Discovery
Warren Hare	BCMM	IKBSAS	\$80,000	Mitacs Accelerate
York Hsiang	ENMM	Surgery	\$671,870	CIHR – NSERC; Vancouver Coastal Health
Lorne Whitehead	ENMM	Physics and Astronomy	\$1,629,700	Alfred P. Sloan Foundation; NRC; BCIC Ignite Fund



Member name	Cluster	Faculty	\$ Amt Received	Major Grants/Contracts
Abbas Milani	ATMM	School of Engineering	\$764,411	Mitacs Accelerate; NSERC (Connect Grants-Level 2); Ryde Holdings; NRC-IRAP Cto program
Kevin Golovin	PNMM	Applied Science	\$162,760	NSERC Discovery Grant
Jian Liu	ENMM	Applied Science	\$314,000	CFI; BCKDF; NSERC Discovery Grant
Jeffrey Andrews	ENMM	IKBSAS	\$200,000	NSERC Discovery Grant; UBC Okanagan Eminence Fund
Lukas Bichler	ATMM	School of Engineering	\$970,956	NSERC SPG; Mitacs Accelerate
Hadi Mohammadi	BBMM	School of Engineering	\$123,000	NSERC ENGAGE; NSERC CRD; School of Engineering Research Tools
Total			\$5,935,036.00	

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.

ATMM

- 1) M.H. Kashani, A. Hosseini, F. Sassani, F.K. Ko, A.S. Milani (2018) "The role of intra-yarn shear in integrated multi-scale deformation analyses of woven fabrics: A critical review", *Critical Reviews in Solid State and Materials Sciences*, 43(3): 213-232.
- 2) J Van Brummelen, M O'Brien, D Gruyer, H Najjaran (2018) "Autonomous vehicle perception: The technology of today and tomorrow", *Transportation Research Part C: Emerging Technologies*, 89: 384-406.
- 3) A. Rashidi, A. S. Milani (2018) "Passive control of wrinkles in woven fabric preforms using a geometrical modification of blank holders", *Composites Part A*, 105: 300-309.
- 4) A. Prasad, L. Malakkal, L. Bichler and J. A. Szpunar, 2017, "Challenges in Spark Plasma Sintering of Cerium (IV) oxide", *Ceramic Material Transactions*, Vol. 261, pp. 217 – 227.
- 5) K. Akkiraju, N. Chawake, S. Kashyap, B. S. Murty, L. Bichler, 2017, "Novel coalescence-driven grain-growth mechanism during annealing/spark plasma sintering of NiO nanocrystals, *Journal of the European Ceramic Society*, JECS-D-17-06633.
- 6) A. Prasad, S. Doja and L. Bichler, 2017, "On the effect of electric field during spark plasma sintering: A Faraday Cage approach", *Ceramic Material Transactions*, Vol. 261, pp. 127 – 137.

BBMM

- 1) Mahmoudi, M., Pakpour, S., Perry, G., and Pollock, J. (2018) "Drug-Abuse Nanotechnology: Opportunities and Challenges", *ACS Chemical Neuroscience*.
- 2) Pakpour, S., Bhavadia, A., Zue, R., Amarnani, A., Gibbons, S. M., Gurry, T., Martello-Rooney, L., Alm, E. J. (2017) "Identifying predictive features of *Clostridium difficile* infection recurrence before, during, and after primary antibiotic treatment", *Microbiome*, 5: pp 1-10.
- 3) Crawford, B., Pakpour, S., Kazemian, N., Klironomos, J., Milani, A.S., (2017) "Effect of fungal deterioration on physical and mechanical properties of hemp and flax natural fiber composites", *Materials*, 10: pp 1-14.
- 4) Humphreys MR, Shah OD, Monga M, Chang YH, Krambeck AE, Sur RL, Miller NL, Knudsen BE, Eisner BH, Matlaga BR, Chew BH. Dusting versus basketing during ureteroscopy - Which technique is more efficacious? A prospective multi-center trial from the EDGE Research Consortium. *J Urol*. 2017 Dec 15. pii: S0022-5347(17)78115-3.
- 5) Janssen C, Buttyan R, Seow CY, Jäger W, Solomon D, Fazli L, Chew BH, Lange D. A Role for the Hedgehog Effector Gli1 in Mediating Stent-induced Ureteral Smooth Muscle Dysfunction and Aperistalsis. *Urology*. 2017 Jun;104:242.e1-242.e8.

- 6) Chew BH, Rebullar KA, Harriman D, McDougall E, Paterson RF, Lange D. Percuflex Helical Ureteral Stents Significantly Reduce Patient Analgesic Requirements Compared to Control Stents. *J Endourol.* 2017 Dec;31(12):1321-1325.
- 7) Earl E, Mohammadi H., (2018). Improving Finite Element Results in Modeling Heart Valve Mechanics, Part H, *Journal of Engineering in Medicine*, 232(7): 718-725.
- 8) Jahandardoost M., Ohlmann L., Fradet G., Mohammadi H. (2018) Effect of the Heart Rate on the Hemodynamics of the Elliptic St. Jude Medical Valve; A Computational Study, *Journal of Mechanics in Medicine and Biology*, 18(2): 1850014.
- 9) Mohammadi H, Fradet G. (2018). Proposed percutaneous aortic valve prosthesis made of cryogel. *Journal of Biomechanics*, Accepted, BM-D-17-00833.
- 10) Maynard, M, Hilt, M, Heath, E, and Jirasek, A. 2017. Evaluation of accuracy and precision in polymer gel dosimetry. *Med Phys.* 44(22), pp. 736-746.
- 11) R. G. Sobral-Filho, A. M. Brito-Silva, M. Isabelle, P. Wan, A. Jirasek, J. J. Lum, A. G. Brolo. 2017. Plasmonic Labeling of Subcellular Compartments in Cancer Cells: Multiplexing with Fine-tuned Gold and Silver Nanoshells. *Chem Sci.* 8, pp. 3038-3046.
- 12) Chen X, Assadsangabi B, Brox D, Hsiang YN, Takahata K. A pressure-sensing smart stent compatible with angioplasty procedure and its in vivo testing. *IEEE* 2017; 978-1-5090-5078-9/17/.
- 13) Chen X, Assadasangabi B, Hsiang YN, Takahata K. Enabling angioplasty-ready “smart” stents to detect in-stent restenosis and occlusion. *Advanced Science*. 2018 10.1002/advs.201700560.

BCMM

- 1) M. Kamali, K. Hewage, A. S. Milani, (2018) “Life cycle sustainability performance assessment framework for residential modular buildings: Aggregated sustainability indices”, *Building and Environment*, 138: 21-41.
- 2) C. Audet and W. Hare. *Derivative-free and Blackbox Optimization*. Springer International Publishing AG, Switzerland, 2017.
- 3) Li, S., Dezfouli, F.H., Wang, J-Q., Alam, M.S. 2018. “Displacement-based seismic design of steel, FRP and SMA cable restrainers for isolated simply supported bridges,” in press, *Journal of Bridge Engineering*, ASCE.
- 4) Billah, A.H.M.M. and Alam, M.S. (2018). “Probabilistic seismic risk assessment of concrete bridge piers reinforced with different types of shape memory alloys,” *Engineering Structures*, 162 (May): 97-108, Elsevier.
- 5) Moradi, S., Alam, M.S. 2018. “Closure to “Lateral Load-Drift Response and Limit States of Posttensioned Steel Beam-Column Connections: Parametric Study” by Saber Moradi, and M. Shahria Alam,” in press, *Journal of Structural Engineering*, ASCE.
- 6) Parghi, A., Alam, M.S., 2017. “A review on the application of sprayed-FRP composites for strengthening of concrete and masonry structures in the construction sector,” in press, *Composite Structures*, Elsevier.

7) Haque, R., Alam, M.S. 2017. "Hysteretic behaviour of a piston based self-centering (PBSC) bracing system made of superelastic SMA bars – A Feasibility Study," Structures, Elsevier, 12:102-114.

ENMM

1) Delichte, S. D., Y. J. Lu, and J. S. Bobowski. "Non-radiative mid-range wireless power transfer: An experiment for senior physics undergraduates." American Journal of Physics. 86. (2018): 623 – 632.

2) Bobowski, J. S. "Probing split-ring resonator permeabilities with loop-gap resonators." CANADIAN JOURNAL OF PHYSICS. Accepted (in press) (2018): 11 pages.

3) Whitehead, L., Papamichael, K. and Siminovitch, M., "Colour preference in lighting – A misleading name for an unscientific idea", Lighting Research and Technology 49 (2017).

4) Ilic, I., Whitehead, L. and Webster, M., "Contrast adaptation and illuminant spectra", Journal of Vision 17(10) (2017).

5) David, A. and Whitehead, L., "LED-based white lights – a research forefront in physics and ergonomics", Comptes Rendus Physique (in press) (2018).

6) Y. Liu, J. Liu, J. Wang, M. Banis, B. Xiao, A. Lushington, W. Xiao, R. Li, T-K Sham, G. Liang, X. Sun, "Evidence of size-dependent conductive phase on lithium iron phosphate during carbon coating", Nature Communications, 2018, 9, 929.

7) B. Wang, J. Liu, M.N. Banis, Q. Sun, Y. Zhao, R. Li, T.-K. Sham, X. Sun, "Atomic layer deposited lithium silicates as solid-state electrolytes for all-solid-state batteries", ACS Applied Materials & Interfaces, 2017, 9, 31786-31793.

8) J. Liu, H. Zhu, M.H.Z. Shiraz, "Toward 3D solid-state batteries via atomic layer deposition approach", Frontiers in Energy Research, 2018, 6, 10.

9) Andrews, J., Wickins, J., Boers, N., & McNicholas, P. (2018). teigen: An R Package for Model-Based Clustering and Classification via the Multivariate t Distribution. Journal of Statistical Software, 83(7), 1 - 32.

10) Andrews, J. L. (2018). Addressing overfitting and underfitting in Gaussian model-based clustering. Computational Statistics & Data Analysis.

11) T. Požar, J. Laloš, A. Babnik, R. Petkovšek, M. Bethune-Waddell, K. Chau, G. Lukasiewicz, and N. Astrath, "Isolated detection of elastic waves driven by the momentum of light," Nature Communications, accepted (2018).

12) V. Sieben, S. Molla, F. Mostowfi, C. Floquet, A. Speck, and K. Chau, "Measuring asphaltene deposition onset from crude oils using surface plasmon resonance," Journal of Energy and Fuels 31, 5891-5901 (2017).

13) T. Pozar, J. Lalos, A. Babnik, R. Petkovsek, G. Lukasiewicz, M. Bethune-Waddell, K. J. Chau, and N. Astrath, "Linear momentum flow from light to solid matter," The Autumn Meeting of the Brazilian Physical Society (2018).

PNMM

- 1) Arjmand M, Sadeghi S, Khajepour M, Sundararaj U. Carbon Nanotube/Graphene Nanoribbon/Polyvinylidene Fluoride Nanocomposites: Rheological and Dielectric Properties. *Journal of Physical Chemistry C*, 2017; 121: 169-181.
- 2) Sharif F, Arjmand M (co-first author), Abbasi Moud A, Sundararaj U, Roberts E.P.L. Segregated Hybrid Graphene/Magnetite/PMMA Polymer Nanocomposites Towards Electromagnetic Interference Shielding. *ACS Applied Materials and Interfaces*, 2017; 9:14171-14179.
- 3) Sadeghi S, Arjmand M (co-first author), Otero I, Yazdi AZ, Sundararaj U. Effect of Nanofiller Geometry on Network Formation in Polymeric Nanocomposites: Comparison of Rheological and Electrical Properties of Carbon Nanotube and Graphene Nanoribbon. *Macromolecules*, 2017;50: 3954-3967.
- 4) Al-Ani, L. and M. K. Deyholos (2018). "Transcriptome Assembly of the Bast Fiber Crop, Ramie, *Boehmeria nivea* (L.) Gaud. (Urticaceae)." *Fibers* 6(1).
- 5) Schultz, M. C., J. Zhang, X. Luo, O. Savchenko, L. Li, M. Deyholos and J. Chen (2017). "Impact of Low-Intensity Pulsed Ultrasound on Transcript and Metabolite Abundance in *Saccharomyces cerevisiae*." *Journal of Proteome Research* 16(8): 2975-2982.
- 6) You, F. M., J. Xiao, P. C. Li, Z. Yao, G. F. Jia, L. Q. He, T. T. Zhu, M. C. Luo, X. Wang, M. K. Deyholos and S. Cloutier (2018). "Chromosome-scale pseudomolecules refined by optical, physical and genetic maps in flax." *Plant Journal* 95(2): 371-384.
- 7) K. Golovin and A. Tuteja, "A predictive framework for the design and fabrication of icephobic polymers". *Science Advances*, 3, 9, e1701617 (2017).
- 8) K. Golovin, M. Boban, J. M. Mabry and A. Tuteja, "Designing Self-Healing Superhydrophobic Surfaces with Exceptional Mechanical Durability". *ACS Applied Materials & Interfaces*, 9 (12), pp 11212-11223 (2017). 9)
- 9) J. Gose, K. Golovin, M. Boban, J. M. Mabry, A. Tuteja, M. Perlin, S. L. Ceccio, "Characterization of Superhydrophobic Surfaces for Drag Reduction in Turbulent Flow". *Journal of Fluid Mechanics*, 845, pp. 560-580 (2018).



Current graduate student supervision samples

Cluster	# Grad Students	Supervisor/Co-Supervisor
ATMM	26	Lukas Bichler
	7	Abbas Milani
BBMM	3	Ben Hall Chew
	1	Sepideh Pakpour
	7	Hadi Mohammadi
BCMM	7	Warren Hare
ENMM	11	Andrew Jirasek
	4	York Hsiang
	5	Lorne Whitehead
	2	Jeffrey Andrews
	2	Jian Liu
PNMM	4	Michael Deyholos
	2	Kevin Golovin
Total	81	



Graduated trainees/alumni

Cluster	Alumni Name	Degree/Title	Finish Date
ENMM	Nam Musterer	Research Engineer	2018
	Reily Blackner	BASc (Research Assistant)	2017
	Kiera van der Sande	BASc (Research Assistant)	2017
	Mohammed Al Shakhs	PhD	2017
	Wilhelm Wenngren	MASc	2017
	Peter Ott	Visiting student	2018
ATMM	Lucas Delaby	Visiting student	2018
	Mathew Smith	PhD	2017
	Chinmaya Thakore	M.Eng.	2017
	Anil Prasad	MASc	2017
	Cyril Phillipose	M.Eng	2017
	Somi Doja	MASc	2017
	Antonia Ciocoiu	BASc (Research Assistant)	2018
	Sri Rajagopal	BASc (Research Assistant)	2017
	Samuel Burke	BASc (Research Assistant)	2017
	Masoud Haghi Kashani	PhD	2017
	Hossein Montazerian	MASc	2017
	Ronak Vahed	MASc	2017
	Milad Ramezankhani	MASc	2017
	Safat Rashif	MASc	2017
BBMM	Masoumi, M Mehdi	MASc	2018
Total	21		

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 gradating 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 in 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

Laser Material Processing For Improving Biocompatibility of Implants

Dr. Nazanin Mirhosseini
Laser Processing Research Centre, University of Manchester, United Kingdom

July 31st, 2018; Time: 9:00-10:00 am; Room: EME 4218

Abstract: The challenge in the engineering of implant surfaces is to attract specific targeted cells. Cell attachment is the initial stage for subsequent proliferation and differentiation. It is proven that cell adhesion, growth and differentiation are related to surface energy and roughness.

Laser processing of implants is a well-known process. The process evaporates the original surface layer and re-shapes a desirable micro morphological topology with enhanced surface roughness and chemical compositions to improve biocompatibility. This seminar will present our recent work on promoting osteoblast and endothelial cell adhesion by using laser surface structuring in the Laser Processing Research Centre, UK.

Dr. Nazanin Mirhosseini obtained her PhD in improving biocompatibility of orthopaedic implants by using laser surface modifications from University of Manchester in 2008. Since then she has been working in Laser Processing Research Centre on orthopaedic implants and coronary stents.

Industrial Research & Invited Speaker Presentation Series:

Dr. Nahiene Hamila, INSA Lyon

July 31st, 2018; Time: 10:00-11:00am; Room: EME 4218

Abstract: The ambition to shorten the processing cycle of continuous composite materials requires better control of the defects of the parts and providing manufacturing engineers with information about the forming material mechanical properties. The use of numerical tools seems to be a beneficial way to achieve these objectives, while avoiding a prohibitive cost of development by trial error approaches. Most frequently encountered forming defects are wrinkling, fiber crack, fiber slippage or matrix decompensation. Whatever the defect evoked, its influence on the mechanical properties makes the part often unusable, specially in high tech industries. The modeling of composite materials is identified both by the nature of the matrix and its temperature dependence, and by a wide variety of types of continuous fiber reinforcements. For each of these cases, advanced mechanical models and numerical formulations have been developed in our group, a summary of which will be presented in this seminar.

Nahiene Hamila, Dr. Habil.
Graduated from Paris 6 University (UPMC) in mechanical engineering in 2004, N. Hamila defended her PhD on December 7, 2007 at INSA Lyon. He has since been Associate Professor at INSA Lyon, where he continues his cutting edge research on modeling and simulation of composites during the manufacturing processes.

Industry 4.0 – communication is key

Industry Research Presentation Series:
September 22, 2017; Time: 10:00-11:00; Room: EME 4218

Abstract: The German Aerospace Center is the largest public research center for aerospace in Europe that employs nearly 8000 people in research and administration. One main research area is that of materials and structures. Since several years the Institute of Material Research and the Institute of Structures and Design follow the strategy of the process chain aligned research. Starting from the profound understanding of the mechanical and physical behavior of selected materials, the Institute cover in cooperation with research partners the whole process chain up to the manufacture of a demonstrator. Parallel to the research activities on samples, components and processes digital data and numerical tools are developed along the process chain from micro to macro scale. In light of new developments of the Industry 4.0 movement, long standing paradigms for complex automation systems have to be re-evaluated and improved upon. Machine Learning for production environments, close human machine interaction and highly autonomous systems are already technologically possible. A basic building block for all these systems is flexible machines to machine communication. Especially in machine to machine communication new open communication frameworks like OPC UA are replacing proprietary fieldbuses as the new frameworks allow higher levels of integration of machines and plant-wide, a stronger modularization of machines and hence more production production systems. The presentation provides an exemplary insight into this research field using the example of production of aerospace components.

Dipl.-Inf. Florian Krebs
Florian Krebs was born in Darmstadt, Germany and obtained his degree in computer science at the University of Augsburg, Germany. He spent more than ten years in the DLR Robotics research and development department in Germany gaining hands on industrial experience. In 2009 he joined the German Aerospace Center of the Institute for Structures and Design in Stuttgart and contributed to the establishment of the DLR Center of lightweight production technology in Augsburg. Since 2013 Florian Krebs leads a team at the German Aerospace Center concerned with flexible automation systems. Since 2017 he took over the position of deputy head of the department in Augsburg. In that context Florian Krebs' major research areas lie in industrial robotics, automation technology and data-driven production technology. Currently, his main interest lies in the development of Industry 4.0 inspired automation technologies for future aerospace manufacturing systems.

UBC Design for Industry 4.0 (DFI4) Workshop:

Dr. Homayoun Najjaran (as Chair) and Dr. Abbas Milani (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 (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 Mussone
 - 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 right 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)

[ABOUT](#) [PROGRAMS](#) [COMMUNITY](#) [MEMBERSHIP](#) [OKGNTECH](#) [BLOG](#) [CONTACT US](#)[COMMUNITY](#)

ADVANCED MANUFACTURING VOL. 1



Mahdi Takaffoli joins us as a new #OKGNtech columnist, starting with the first edition of Advanced Manufacturing News.

A GLANCE AT ENABLERS OF ADVANCED MANUFACTURING

In 1954, Del Harder, Vice President for Operations of the [Ford Motor Company](#), who is credited for the invention of the term "automation", delivered a speech entitled "Automation-Key to the Future" in which he described his newly coined word as "the automatic handling of parts between progressive production processes".

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 YEAR

- **Provide networking opportunities for members:** MMRI plans to organize its first series of workshops (a five-day event) in December 2018 where members under each cluster will brief their research activities and meet other members from both campuses as well as external members (video-conferencing facility will be provided).
- **Initiate and manage the NRC IRAP seed funding:** MMRI will officially announce this approved funding 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 NSERC 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. Also for the awarded grants, MMRI will provide assistance in the coordination of project activities at different labs/campuses/organizations as well as assistance in administrative organization and reporting tasks.
- **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 from 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. MMRI is planning to also hold the 2nd 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 the 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.



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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

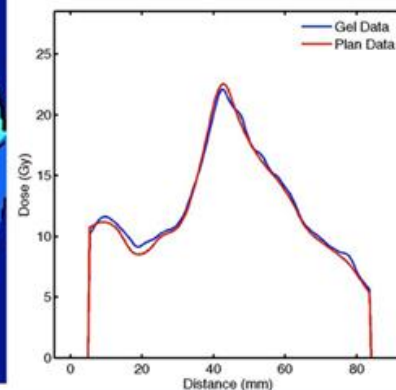
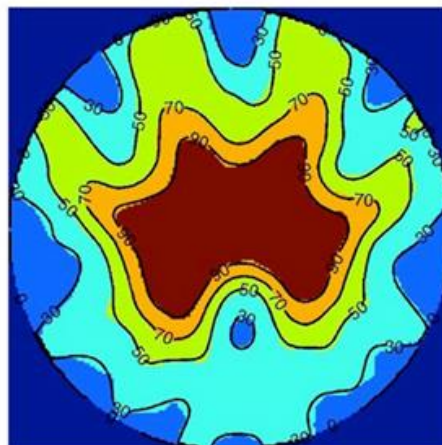
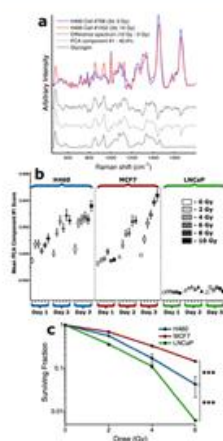
Biomedical and Biological Materials and Manufacturing (BBMM)

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





HYTEC - Kohler Canada Co.



Armstrong, BC

Contact, Position: Diego Faiguenbaum, Sr. Process Engineer

Phone: 250-546-3196

Email: Diego.Faiguenbaum@kohler.com

hytec.ca kohler.com

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

