

19th Annual Alberta Biomedical Engineering Conference Program



October 26th – 28th, 2018
Banff Park Lodge
Banff, Alberta



We gratefully acknowledge the support of our sponsors
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UNIVERSITY OF CALGARY
Biomedical Engineering Graduate Program



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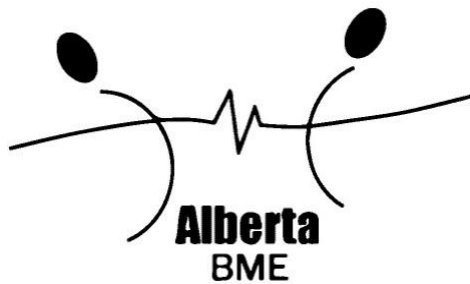


UNIVERSITY OF CALGARY
Biomedical Engineering



McCaig Institute
for Bone and Joint Health

19th Annual Alberta Biomedical Engineering Conference
Banff 2018
Banff 2018



October 26-28, 2018
Banff Park Lodge
Banff, AB

PROGRAM COMMITTEE

CONFERENCE ORGANIZERS

Co-Chairs

University of Calgary

Roman Krawetz
Michael S. Kallos

University of Saskatchewan
University of Alberta
University of Calgary

James Johnston
Hossein Rouhani

Student Co-Chairs

Jacob Kennard
Rakesh Narang

University of Calgary

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University of Calgary

Bruce Pike
John Bertram
Arthur Kuo
Michael Kallos
Bradley Goodyear

University of Alberta

Albert Vette
James Hogan
Kajsa Duke

GUEST SPEAKERS / PODIUM JUDGES

Dr. John Dewitt PhD,CSCS, KBRwyle Fellow KBRwyle -Senior Biomechanist –NASA

Dr. Rita Kandel MD,FRCPC, Clinician-Scientist& Chief, Pathology & Laboratory
Medicine, Mount Sinai Hospital

TRAINEE STUDENT VOLUNTEERS

University of Calgary	Rakesh Narang, Jacob Kennard	BMEG VP Conference Student Leaders
Melina Varguez, Sydney Toutant, Miriam Nightingale		Package assembly, registration packages
Michael Kuczynski, Danielle Whittier, Ibukun Oni, Mariya Shtil		Registration – Banff Park Lodge
Danielle Whittier, Ibukun Oni, Mariya Shtil, Scott Brunet, Leah Ferrie, Sara Pishgar, Lane Harper, Jacob Kennard, Rakesh Narang, Katherine Heger		Session Chairs - Presentations
		Photographer: Andres Kroker

CONFERENCE EVENT COORDINATOR

University of Calgary Elizabeth Mullaney

A BIG THANK YOU TO ALL OF OUR VOLUNTEERS WHO HELPED WITH THE ORGANIZATION AND PLANNING OF OUR CONFERENCE THIS YEAR!

A SPECIAL THANK YOU TO LISA MAYER FOR HER ONGOING SUPPORT OF OUR ANNUAL ALBERTA BME CONFERENCE

PROGRAM

Podium sessions are in the Summit Assiniboine room.

Poster sessions are in the Castle and Alpine Meadows rooms.

You must wear your name badge in order to gain access all meals and conference events (podium, poster sessions, coffee breaks).

FRIDAY

4:30 - 8:30 pm

REGISTRATION and CHECK-IN
Banff Park Lodge Lobby

7:30 pm

Opening Reception – Dr. Kallos/Dr. Krawetz
Location: Glacier Salon

SATURDAY

7:00 – 8:00 am

BREAKFAST – Glacier Chinook

8:00 – 8:02 am

Welcoming Remarks – Dr. Kallos/Dr. Krawetz
Location: Summit Assiniboine

8:02 – 8:05 am

**Joelle Foster, Executive Director, Hunter Hub for
Entrepreneurial Thinking, University of Calgary**

8:05 – 8:08 am

**Tyler Brown, Senior Commercial Account Manager,
RBC Commercial Financial Services – Health Care
Professionals**

8:08 – 8:48 am

Guest Speaker #1:

Dr. Rita Kandel

Session chairs: Jacob Kennard, Scott Brunet

8:48 – 9:58 am

Student Podium Presentation Session #1

Session Chairs: Mariya Shtil, Rakesh Narang

Ferrie, Leah 01

The role of exogenous and endogenous stem cells and biomaterials in bone fracture healing

Heger, Katherine 02

Metabolomics Reveals Abnormal Metabolism in Fibroblasts from Children with the Dilated Cardiomyopathy with Ataxia Syndrome, a Mitochondrial Disease

Bahari, Hosein	03	Predicted threshold against forward and backward loss of balance for perturbed walking
Li, HongZu	04	Heart Beat Anomaly Detection from Two-leads ECG Recordings using LSTM Network
Oliveira Masson, Anand	05	Targeting the cell cycle machinery in adult mesenchymal progenitors to enhance cartilage regeneration after injury
Dalrymple, Ashley	06	Prediction-Based Control of Walking using Intraspinal Microstimulation

9:58 – 11:10 am

Poster Session #1 (ODD NUMBERED POSTERS)

COFFEE/BEVERAGE BREAK

Castle and Alpine Meadows

Judges: University of Alberta: Drs. Dan Romanyk, Hossein Rouhani; University of Calgary: Drs. Colin Dalton, Sarah Manske, Leping Li, Walter Herzog; University of Saskatchewan: Dr. James D. Johnston

Shin, Joonhwan	01	Control of Pedal Force Direction in Cycling
Besler, Brendon	03	Developing Phantoms for Ultrawideband Microwave Applications
Hafeez, Muhammad Bilal	05	An In Vitro Study of Islet Cell Biology for Enhanced Cellular Transplantation Treatments
Paxman, Tyler	07	Experimental evaluation of pressure drop for flows of air and helium-oxygen through upper and central conducting airway replicas of 4- to 8-year-old children
Hu, David	09	Safety of Intraoperative Intraspinal Microstimulation – Implications Towards Functional Mapping of the Spinal Cord
Michalski, Andrew	11	Internal density calibration for opportunistic CT bone health assessment
Sunba, Saud	13	The Effect of Retinal Pigment Maturation on Photoreceptor Survival
O'Yeung, Brennan	15	Control of Pedal Force Direction in Cycling
Plett, Ryan	17	Quantifying vascular calcifications and vitamin D doseresponse using advanced bone imaging
Pishgar, Sara (Roofia)	19	Enhancing signal quality of 3-dimensional microfabricated electrodes on flexible circuit for detecting subdural epileptogenic zone
Abraham, Brett	21	The Impact of Bioreactor Shear Stress on Maintenance of Embryonic Stem Cell Pluripotency Cultured in the Absence of LIF
Finch, Dylan	23	Investigating DC-sputtering as an alternative fabrication technique of thin film biosensor electrodes for water quality testing

Chan, Rachel	25	A Further Investigation of the Generation of Consensus Nanopore Signals using Dynamic Time Warp Barycenter Averaging (DBA)
Kroker, Andres	27	The effects of ACL tears on bone in human knees: the first 8 months postinjury
Loundagin, Lindsay	29	Relationship between Finite Element Predicted Strain and Fatigue Life of Rabbit Tibiae
Kennard, Jacob	31	Differential gene expression in Rupture-Prone Abdominal Aortic Aneurysms
Yazdanbakhsh, Fatemeh	33	Automated performance evaluation of virtual surgery
Vandergaag, Isbella	35	Childhood Physical Activity is Correlated with Bone Microarchitecture in Young Adults
Espinosa, Alvaro	37	Developing a Mechanical Model of White Line Separation in Bovine Claws
Francis, Destiny	39	Establishing an Imaging Protocol for Bone Marrow Lesions and Cysts in the Dunkin-Hartley Guinea Pig Knee using Magnetic Resonance Imaging and Micro-computed Tomography
Fiori, Cyrus	41	UV Spectrophotometry is not Effective for Measuring 5-Fluorouracil Hydrolysis in PBS
Nevarez Diaz, Samaria	43	Bench-Top Gluten Detection Device
Besler, Bryce	45	Simulating Age Related Bone Loss using Level Set Motion
Joury, Jumana	47	Development and Usability Testing of a Custom Positioning Surgical Guide for Autologous Breast Reconstruction

11:10 – 12:30 pm

Student Podium Presentation Session #2

Session Chairs: Ibukun Oni, Sara Pishgar

Sun, Ruixiang	07	Comparison of Wear on Articulating Cartilage Against Titanium Alloy, Cartilage, and Menisci
Ejalonibu, Hammed	08	Quantum Material Growth for Low-Field MRI Detectors
Whittier, Danielle	09	Women with hip fractures can be classified by bone microarchitecture with supervised machine learning methods
Firminger, Colin	10	Evaluating the ‘Jumper’s Knee Paradox’ with Probabilistic Modeling
Narang, Rakesh	11	Rapid antibiotic susceptibility testing using novel microwavemicrofluidic sensor
Phelps, Jolene	12	Adipose stem cell-derived extracellular vesicles promote angiogenesis in brain microvascular endothelial cells
Bohidar, Pallavi	13	A Novel Approach to Investigate TRASE 1D Sequence Performance in Imperfect B1 Fields

12:30 – 1:45 pm

LUNCH – Glacier Chinook

1:45 – 2:30 pm

INDUSTRY PANEL SPEAKERS:

Dr. Jan Kowalczewski, Medical Developer, LupinPharma
Canada, University of Alberta

Ms. Christine Goudie, MDes, Med 3D Network, Memorial
University of Newfoundland

2:30 – 2:35 pm

BREAK – Group Pictures

2:35 pm – 3:50 pm

Poster Session #2 (EVEN NUMBERED POSTERS)

COFFEE/BEVERAGE BREAK

Castle and Alpine Meadows

**Judges: University of Alberta: Drs. Dan Romanyk,
Hossein Rouhani; University of Calgary: Drs. Colin
Dalton, Sarah Manske, Leping Li, Walter Herzog;
University of Saskatchewan: Dr. James D. Johnston**

Colter, James	2	Embedded Instrumentation for Stem Cell Bioprocess Optimization
Obi-Alago, Oluchukwu Roseline	4	Detecting Thermal Signature Abnormalities for Healthcare Applications
Brunet, Scott	6	Using Image Registration for the Analysis of Bone Damage in Rheumatoid Arthritis
Parhizi, Behdad	8	Inter-Joint Coupling during Elbow Flexion and Extension
Saha, Sourav	10	Transcriptional Profile of Schwann Cells Using Bioinformatics Approach
Oni, Ibukunoluwa	12	A Novel fNIRS-EEG Imaging System for Simultaneous Measurements of Hemodynamic and Electrical Brain Activity
Yee, Nicholas	14	Simulated dynamic hip screws redistribute von Mises stress and Mohr-Coulomb predicted yield regions away from femoral necks
Sachan, Surbhi	16	Automatic performance metric assessment of virtual temporal bone dissection
Behling, Anja-Verena	18	Longitudinal arch angle and Achilles tendon angle dominate foot movement
Pouranbarani, Elnaz	20	Consideration of Cardiac Intercellular Property in Tuning the Parameters of Human Ventricular Cell Model
Pieper, Keilan	22	Using Dual Fluoroscopy to assess internal Cervical Vertebra Kinematics
Das, Nabangshu	24	Proteolytic Regulation of Lubricin /PRG4 Structure and Function in Inflammation
Corpuz, Jessica May	26	The Effect of Chondrocyte Depletion on the Structural and Functional Properties of Murine Articular Cartilage

Hoitz, Fabian	28	The Preferred Movement Path Paradigm: Influence of Running Shoes on Muscle Activity
Samadi, Amin	30	The Effect of Cell Cycle Modulation on Nanoparticle based Gene Delivery
Harper, Lane	32	Mechanoplripotency: pluripotency maintenance observed in stirred-tank bioreactors due to mechanical stimulation causing specific biochemical responses
Mauthner, Micaela	34	A comparison of magnetic resonance spectroscopy analysis softwares LCMoel and Tarquin in orthopedic injury controls
Mahmood, Sheharzad	36	Does residual force enhancement depend on the amount of muscle or fibre stretching?
Duong, Kevin	38	Evaluation of the Impact of Micro-perforations on Cryoprotectant Permeability and Mechancial Properties of Porcine Articular Cartilage
Argumeedi, Srija	40	Investigation on Human Blood Interactions with Hemodialysis Membrane Surface
Zaluski, Dylan	42	Validating finite element models of the knee using digital volume correlation: A feasibility study
Haider, Kazim	44	Novel biomimetic multi-electrode array provides high resolution extracellular recordings of mouse hippocampal neurons during in vitro network formation
Bruce, Olivia	46	Data reduction analyses for accelerometer-based measures of damage accumulation
Hernandez, Maria	48	Mechanical Properties of the Aponeurosis and Achilles Tendon System
Goudie, Luke	50	Inhibition of Pathological Mitochondrial Fission Preserves Mitochondrial Morphology and Function in DSS Treated Intestinal Epithelial Cells

3:50 – 5:10 pm

Student Podium Presentation Session #3

Session Chairs: Scott Brunet, Leah Ferrie

Francis, Sierra	14	Modular Software Console for Gradient-Free MRI: A Potential Graphical User Interface for Space MRI
Dong, Rachael	15	Evaluation of the Effects of Ice Recrystallization Inhibitors on Porcine Chondrocyte Cell Membrane Integrity
Nwaroh, Chidera	16	Effects of Transcranial Direct Current Stimulation on Metabolite Concentrations
Borys, Brenna	17	Bioreactor Scale-up of Embryonic Stem Cells from Low Inoculation Densities
Kazeminejad, Amirali	18	Using Different fMRI Parcellation Atlases Affects Automatic Diagnosis of Autism Spectrum Disorder
Stadnyk, Meredith	19	Lower limb functional muscle strength in female varsity soccer and rugby athletes
Aljezani, Nedaa	20	Global Proteomic and Genomic Expression Characterization of Synovial MSC From Normal and OA knee joint

6:00 – 7:00 pm

DINNER – Glacier Chinook

7:00 pm

“THE GREAT CHALLENGE” – Lynx Salon

8:00 pm

**SOCIAL – ELK AND OARSMAN
– SEE DIRECTIONS FOLLOWING PROGRAM**

SUNDAY

7:15 – 8:15 am

BREAKFAST – Glacier Chinook

8:15 – 8:40 am

Checkout

8:40 – 8:45 am

Spencer Glenn, Investment Advisor, RBC Wealth Management Dominion Securities

8:45 – 9:25 am

Guest Speaker #2:

Dr. John De Witt

Session Chairs: Ibukun Oni, Danielle Whittier

9:25 – 10:20 am

Student Podium Presentation Session #4

Session Chairs: Lane Harper, Jacob Kennard

Nazeer, Sadhiq	21	Force After Active Stretch Is Not Reduced Following a Damaging Stretch in Skinned Muscle Fibres
Spanswick, Phillip	22	Alterations in Bone Density Due to Fracture Healing at the Distal Radius is Correlated with Age
Mangal, Adbhut	23	Coating endovascular coils with PLGA and IL-1 β to increase action and attraction of mesenchymal stem cells
Jelani, Neum	24	Cell Viability in Chondrocytes with Non-Impact Induced Crack and Dynamic Loading
Geeraert, Bryce	25	White matter maturation in late childhood is dominated by axonal packing and not myelin

10:20-10:40 am

Poster Session #3 (FINALISTS ONLY)

Judges: University of Alberta: Drs. Dan Romanyk, Hossein Rouhani; University of Calgary: Drs. Colin Dalton, Sarah Manske, Leping Li, Walter Herzog; University of Saskatchewan: Dr. James D. Johnston

COFFEE/BEVERAGE BREAK; Activity from BMEG

10:40 – 11:35 am

Student Podium Presentation Session #5

Session Chairs: Danielle Whittier, Katherine Heger

Fung, Eric	26	Effects of Electromagnetic Radiation on Neuron Development
Shtil, Mariya	27	Assessment of Mechanical Strength Underlying Bone Lesions in ACL Tears
Hassanpour Tamrin, Sara	28	An Integrated Electrokinetic Microfluidic Device to Study Exosome Isolation

11:45 – 12:30 pm

CLOSING REMARKS

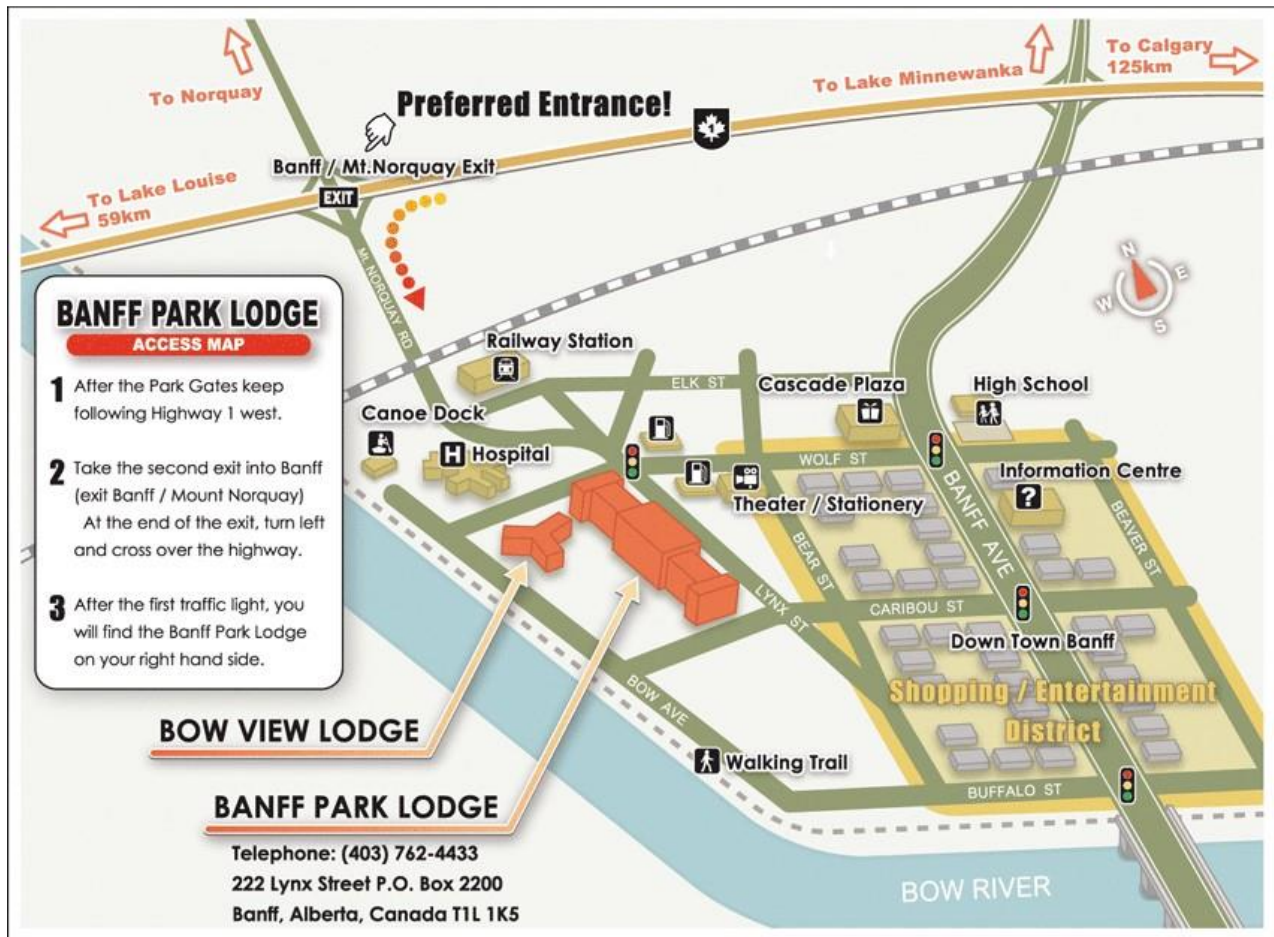
Final Award Presentations

REMINDER:

Please return all name tags and judges' clipboards at the end of the conference. We thank you for your cooperation.

SEE YOU IN 2019 for our 20th anniversary!

Banff Park Lodge Map and Meeting Location



DIRECTIONS TO ELK AND OARSMAN, SATURDAY NIGHT EVENT

From: Banff Park Lodge Resort Hotel & Conference Centre

- Head south on **Lynx Street** toward Caribou Street (83 m)
- Turn left onto **Caribou Street** (160 m)
- Turn right onto **Banff Avenue**
- Destination will be on the right (130 m)

2018 ALBERTA BME CONFERENCE SPONSORS – THANK YOU!!

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BRONZE	
	<p>Canadian Society for Biomechanics</p> <p>University of Calgary</p> <p>Hotchkiss Brain Institute Libin Cardiovascular Institute of Alberta</p>

GUEST SPEAKER #1



Dr. Rita Kandel, MD, FRCPC

Clinician-Scientist & Chief, Pathology & Laboratory Medicine, Mount Sinai Hospital

Rita Kandel, MD, FRCPC(C) obtained her medical degree and did her Pathology residency at the University of Toronto. She did postdoctoral fellowships at Tufts University and Harvard University in Boston.

She is currently the Chair of the Department of Laboratory Medicine and Pathobiology at the University of Toronto and Chief of Department of Pathology and Laboratory Medicine at Sinai Health System. Her research has focused on utilizing regenerative medicine approaches to develop biological treatments for back pain and arthritis. Rita has published over 240 papers and multiple book chapters. She is an Associate Editor of the journal *Cartilage* and serves on the Editorial Boards of several journals. She is the recipient of several honours and awards. Notably, she is a Fellow of the Canadian Academy of Health Sciences.

GUEST SPEAKER #2

Dr. John K. DeWitt, PhD, CSCS



KBRwyle Fellow KBRwyle -Senior Biomechanist –
NASA

Dr. John De Witt is a Senior Biomechanist employed by KBRWyle in Houston, TX, and currently works at NASA Johnson Space Center with the Crew Health and Performance Systems Maturation Team. The NASA Systems Maturation Team goals are to identify and mature technologies that will be necessary to allow

deep space exploration beyond low Earth orbit, including medical, exercise, and food systems.

Dr. De Witt currently serves as the Project Scientist for the Advanced Twin Lifting and Aerobic System (ATLAS) exercise device that is intended for use on the Gateway exploration vehicle that is scheduled to be launched in the 2020's and to serve as the launch platform for future lunar and Martian expedition missions. Prior to working with the Systems Maturation Team, Dr. De Witt worked in the Exercise Physiology Laboratory at NASA JSC where he lead multiple scientific projects focused on the biomechanics of exercise in microgravity, including studies performed on the International Space Station.

Dr. De Witt has published multiple peer reviewed articles and has been an invited speaker at several domestic and international conferences. Dr. De Witt received his PhD from the University of Texas Medical Branch, his MS from Arizona State University, and his BSEE and BSCSE from the University of Toledo.

INDUSTRY PANEL MEMBER #1



Dr. Jan Kowalczewski,

Medical Developer, LupinPharma Canada, University of Alberta

Jan graduated with a PhD from the University of Alberta in Neuroscience where he invented 2 medical devices and commercialized them following his studies. The first device improved stroke and spinal cord injury outcomes, and is available worldwide via Rehabtronics Inc. The second was a nerve cuff. He has been involved in the commercialization of 5 medical devices to date, in various capacities in the field of respirology, diagnostics and acute care. Jan has been in the pharmaceutical and medical devices field for 13 years, most recently leading the medical team for Lupin Pharma in Canada. To date Jan has been awarded 2 patents, 14 publications in this space.

Lupin Pharma in Canada

Lupin Inc is a large global generic pharmaceutical company launching a branded business in Canada with a mixture of medical devices and pharmaceuticals both generic and branded. Currently they focus on the gastrointestinal and respiratory space. The company launched in Canada in 2015 with its flagship product Zaxine for the indication of Hepatic Encephalopathy.

INDUSTRY PANEL MEMBER #2



Ms. Christine Goudie,

MDes, Med 3D Network, Memorial University of Newfoundland

Experienced Biomedical Designer and Researcher with indepth experience spanning medical device design, health care simulation, 3D printing, technical illustration, clinical trial ethnographic research and assistive device human factors.

Currently contracted by MUN Med 3D of Memorial University of Newfoundland, for the research, development and design of medical task trainers for use in simulation-based medical education (SBME) and the surgical planning of high acuity, low occurrence (HALO) procedures. Also responsible for the development of the biomedical outreach initiative, Med 3D Network and the implementation of six rural hospital 3D print labs within Atlantic Canada in 2018, to teach clinical teams how to advance onsite simulation training.

Involved as a Volunteer Research Assistant with the international medical outreach initiative Team Broken Earth (brokenearth.ca), to host 3D printing training seminars in Dhaka, Bangladesh as well as to test the efficacy of a recently developed Obstetrics and Gynecology perineal repair simulation task trainers.

Passion for entrepreneurship and health care innovation. Graduate of Carleton University with a Master of Design, M.Des. (Industrial Design + Biomedical Engineering).

NOTES

NOTES

Biomedical Engineering

Ready to make a difference

Located in the engineering capital of Canada, the University of Calgary's Biomedical Engineering program is advancing knowledge and solving problems in animal and human biology, medicine and health-care by educating the next generation of leaders.

Ready to contribute

Our undergraduate students have the strengths of a traditional engineering degree at the Schulich School of engineering, advanced knowledge of biomedical engineering and valuable hands-on work experience.

Multi-disciplinary teamwork

Our graduate students participate in teams with researchers in engineering, kinesiology, medicine, nursing, science and veterinary medicine at an institution committed to investing significantly in biomedical research.

Partners in Research

Researchers work towards making an impact through scientific discoveries, innovative and market-driven technologies, and solutions to enhance the wellness and well-being of all throughout the lifespan. We look for opportunities to link with industry and international entities to provide market-ready graduates and R&D solutions.

collaborative, skilled and experienced – the University of Calgary's biomedical engineers are ready to help your team make a difference today.

ucalgary.ca/bme

graduate email bmegrad@ucalgary.ca

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research email bme@ucalgary.ca



UNIVERSITY OF
CALGARY



Creating the *future* of health

The University of Calgary's Cumming School of Medicine is a leader in health research, with an international reputation for excellence and innovation in health care research and education.

We train the next generation of health practitioners, and take new treatments and diagnostic techniques from the laboratory to the patient, always keeping in mind our goal: *Creating the future of health.*

The medical school was created in 1967 and on June 17, 2014, was formally named the Cumming School of Medicine in recognition of Geoffrey Cumming's generous gift to the university.

Visit us at cumming.ucalgary.ca
or follow us on Twitter [@UCalgaryMed.](https://twitter.com/UCalgaryMed)



UNIVERSITY OF CALGARY
CUMMING SCHOOL OF MEDICINE



Where people, talent and ideas collide

What is the Hunter Hub for Entrepreneurial Thinking?

The Hunter Hub is the University of Calgary’s new initiative to engage and immerse students, faculty, staff, alumni and the Canadian community in a culture of entrepreneurial thinking, challenging them with a new and bold approach to teaching, learning, discovery and knowledge-sharing.

The Hunter Hub for Entrepreneurial Thinking was created in 2017 with a \$40-million gift from the Hunter Family Foundation as an interdisciplinary nucleus for activities that will support entrepreneurial student experiences, enable faculty to lead in innovation, and expand a growing community of entrepreneurial and innovative thinkers

Health Innovation Program

The HIP coordinates efforts in health innovation, including but not limited to:

- Faculty and staff, students, postdoctoral scholars, and alumni who conduct health research and education in health related faculties.
- Community partners who are interested in contributing to the health innovation pipeline.
- Creates a network of existing and new resources of programs and initiatives supporting the health innovation pipeline.

Who is the Hub for?

It’s for everyone! The innovation, social enterprise and entrepreneurial communities including: students, student clubs, faculty members, staff, alumni, Calgary and Canada.

How can the Hub help you?

The Hunter Hub is a safe place to try out your entrepreneurial ideas. Do you want to learn what entrepreneurial thinking is? Do you have an idea for a business? We can connect you with information on all aspects of starting a business or side hustle.

Do you have entrepreneurial expertise to share?

We’re always on the lookout for entrepreneurs to share their experiences and expertise with our students and growing entrepreneurial community. Want to join a panel, present a workshop, or share your entrepreneurial journey? We’re also looking to host entrepreneurs-in-residence and mentors to help guide emerging entrepreneurs. If this is you, let us know!



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[McCaig Institute for Bone and Joint Health](#) Silver

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The McCaig Institute for Bone and Joint Health is home to basic scientists, physicians, biomedical engineers, health system experts and researchers in training working together to improve the bone and joint health of Albertans. Through research excellence and regional partnerships with Alberta Health Services' Bone and Joint Health Strategic Clinical Network and the Alberta Bone and Joint Health Institute, the McCaig Institute has become a global leader in musculoskeletal research.

Research in the McCaig Institute focuses on **understanding** the causes of bone and joint conditions, **preventing** long-term damage, **diagnosing** disease earlier, **developing** new treatments and **transforming** research findings into real-world solutions.

Together, we are committed to a future of pain free *Mobility for Life*.

