19th Annual Alberta Biomedical Engineering Conference Program

October 26th – 28th, 2018
Banff Park Lodge
Banff, Alberta
We gratefully acknowledge the support of our sponsors for making this conference a success.
# PROGRAM COMMITTEE

## CONFERENCE ORGANIZERS

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<th>Co-Chairs</th>
<th>University of Calgary</th>
<th>Roman Krawetz</th>
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<td>University of Saskatchewan</td>
<td>Michael S. Kallos</td>
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<td>University of Alberta</td>
<td>James Johnston</td>
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<td>Hossein Rouhani</td>
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<td>Student Co-Chairs</td>
<td>University of Calgary</td>
<td>Jacob Kennard</td>
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<td>Rakesh Narang</td>
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### University of Calgary
- David A. Hart
- Roman Krawetz
- John Tyberg
- Laura Curiel
- Zelma Kiss
- Orly Yadid-Pecht

### 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

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<th>University of Calgary</th>
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<th>BMEG VP Conference Student Leaders</th>
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<td>Melina Varguez, Sydney Toutant, Miriam Nightingale</td>
<td>Package assembly, registration packages</td>
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<td>Michael Kuczynski, Danielle Whittier, Ibukun Oni, Mariya Shitil</td>
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<td>Danielle Whittier, Ibukun Oni, Mariya Shitil, Scott Brunet, Leah Ferrie, Sara Pishgar, Lane Harper, Jacob Kennard, Rakesh Narang, Katherine Heger</td>
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### 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

<table>
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<th>Time</th>
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| 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

<table>
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<td>7:00 – 8:00 am</td>
<td>BREAKFAST – Glacier Chinook</td>
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| 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 dose-response 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
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 microwave-microfluidic 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, MD, MD 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

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<td>Longitudinal arch angle and Achilles tendon angle dominate foot movement</td>
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<td>The Effect of Chondrocyte Depletion on the Structural and Functional Properties of Murine Articular Cartilage</td>
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<td>The Preferred Movement Path Paradigm: Influence of Running Shoes on Muscle Activity</td>
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Duong, Kevin 38 Evaluation of the Impact of Micro-perforations on Cryoprotectant Permeability and Mechanical 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-1β 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
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!
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!!

#### GOLD

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#### SILVER

| Royal Bank of Canada, Commercial Banking Health Care |
| Royal Bank of Canada, Wealth Management |
| University of Calgary |
| Biomedical Engineering Calgary |
| Hunter Hub for Entrepreneur Thinking |
| McCaig Institute for Bone and Joint Health |

#### BRONZE

| Canadian Society for Biomechanics |
| University of Calgary |
| Hotchkiss Brain Institute |
| Libin Cardiovascular Institute of Alberta |
GUEST SPEAKER #1

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

Rita Kandel, MD, FRCP(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.
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 in-depth 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).
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 healthcare 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
undergraduate email bioengineering@ucalgary.ca
research email bme@ucalgary.ca
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.
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.

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!

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.

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.
McCaig Institute for Bone and Joint Health
Silver Level Sponsor

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.