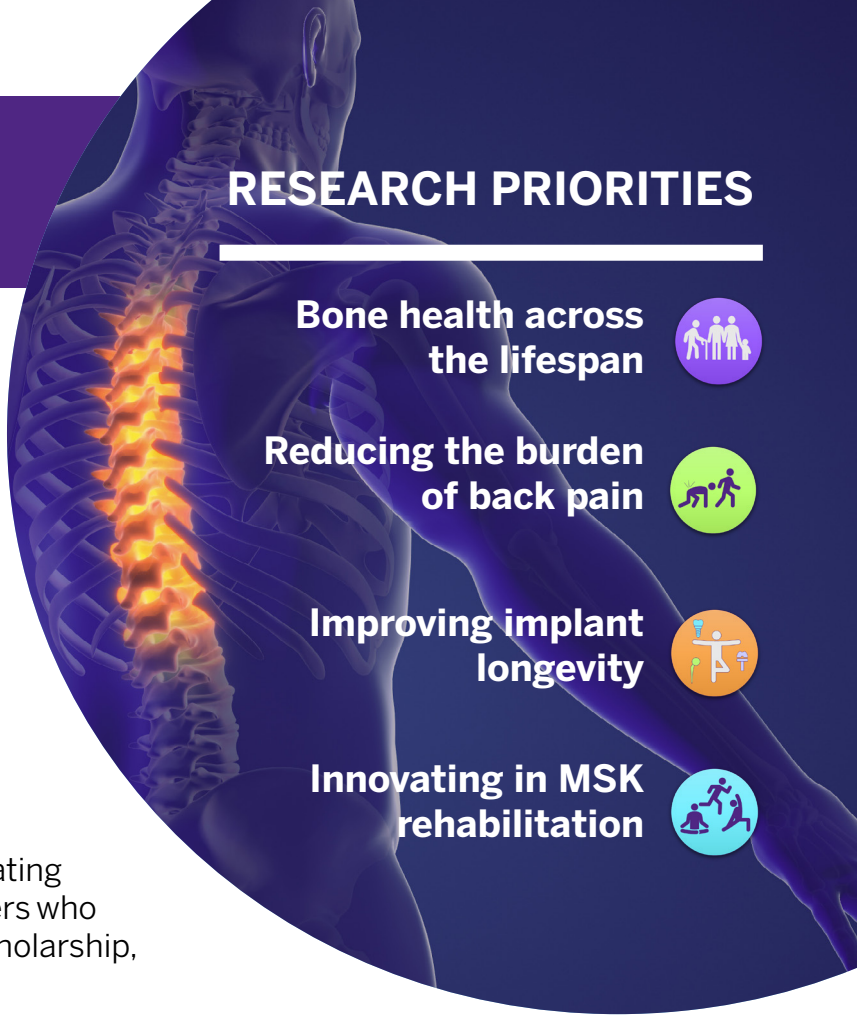
2024 Annual Report

MUSCULOSKELETAL HEALTH

Western Bone and Joint Institute

INSTITUTE AT A GLANCE



RESEARCH PRIORITIES

Bone health across the lifespan

Reducing the burden of back pain

Improving implant longevity

Innovating in MSK rehabilitation

At the Bone and Joint Institute (BJI), we mobilize interdisciplinary teams of researchers and multi-sectoral partners around grand musculoskeletal (MSK) research challenges of societal importance.

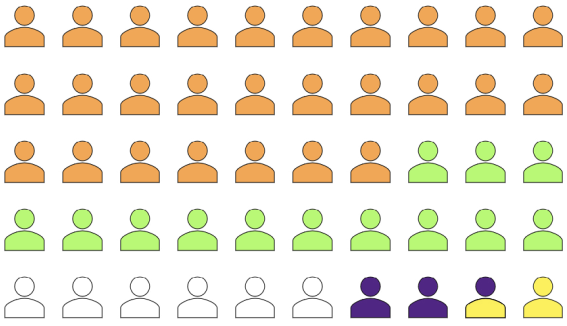
Our goal is to catalyze high-risk ideas and to facilitate the development and implementation of large-scale interdisciplinary research projects.

We are also dedicated to recognizing and celebrating the success of researchers, trainees, and partners who advance interdisciplinary MSK research, scholarship, and creative activity.

MEMBERSHIP OVERVIEW

- Faculty (150)
- Staff (23)
- Trainees (105)
- Partners (53)

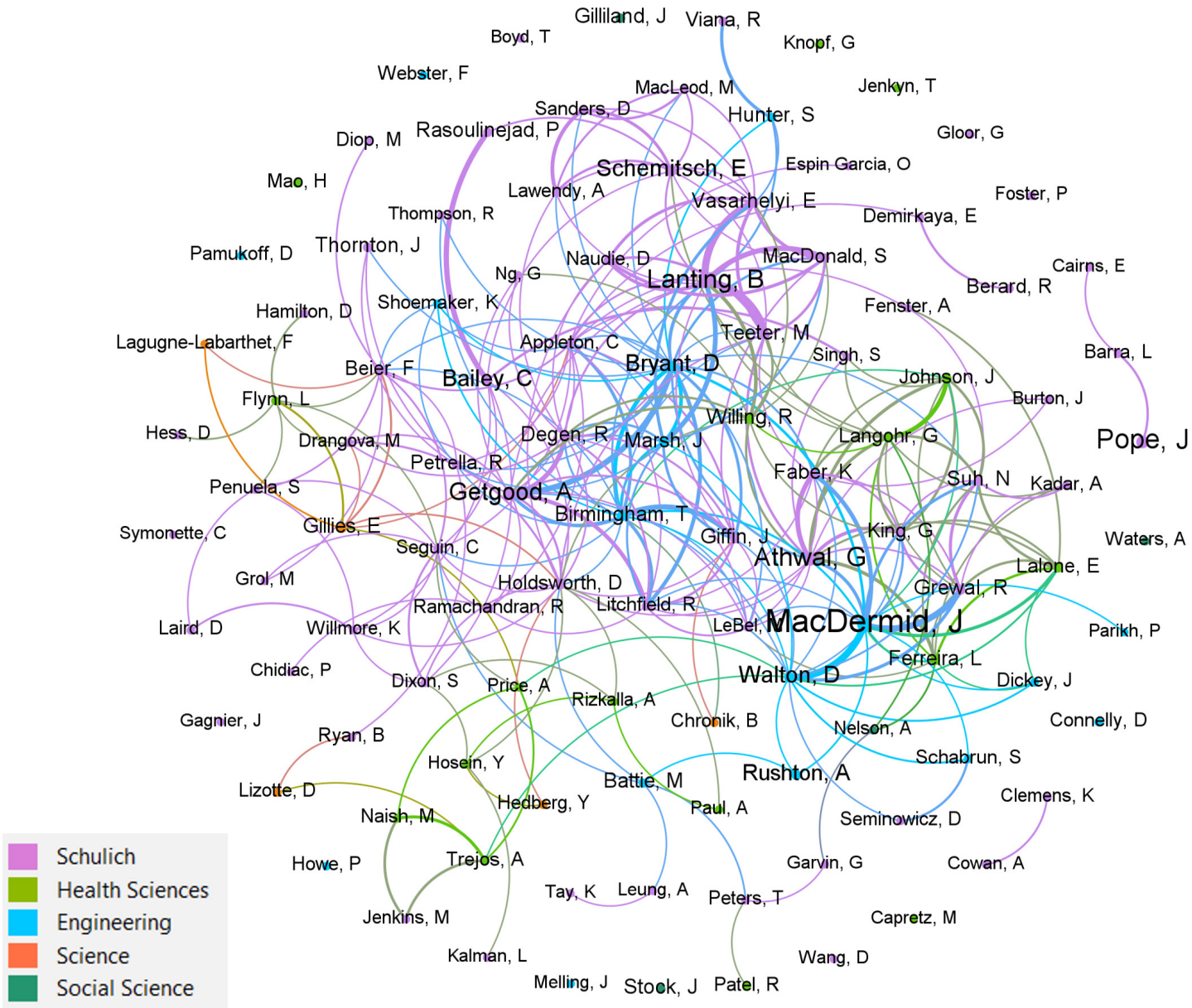
FACULTY DISTRIBUTION



- Schulich School of Medicine & Dentistry (81)
- Health Sciences (38)
- Engineering (18)
- Science (7)
- Social Science (5)

INTERDISCIPLINARITY CO-AUTHORED PUBLICATION MAP

An analysis of co-authored publications among BJI members since 2019 demonstrates extensive interdisciplinary work. Below is a visual representation of interconnections, colour-coded by the home faculty of our members. Breadth of expertise within each faculty would make this map illegible – a true demonstration of the diversity of perspectives moving MSK health research excellence forward in our institute.



IMPLANTS TO IMPROVE PATIENTS' LIVES

The goal of this BJI Grand Challenges Program-funded project is to investigate the corrosion of implant materials, subsequent failures, and the related causes of adverse clinical outcomes that negatively impact people's lives.

Our interdisciplinary project team includes individuals with expertise in surgery, biomaterials, medical imaging, and infection at Western and from national and international partner institutions.

Together, we analyze failed implants and consider a wide range of factors to find solutions that will maximize implant function and longevity. Building on orthopaedic expertise at Western, and leveraging Canada's largest implant retrieval laboratory, the team is also establishing the country's first dental implant retrieval laboratory.

"By bringing together different disciplines, we hope to identify patient and implant factors leading to failure and share this with implant manufacturers and care teams to develop and test new implant technologies and surgical techniques."

– Yolanda Hedberg,
Co-Principal Investigator

Collaboration among experts from: Western, University of Manitoba, The Ottawa Hospital, Orthopedic Innovation Centre (Winnipeg), Precision ADM (Winnipeg), Dartmouth College (USA), and Rush University Medical Centre (USA).

PRELIMINARY OUTCOMES:

- Applied for a $250K New Frontiers in Research Fund - Exploration grant.
- Applied for $20K from the Network for Canadian Oral Health Research.
- Submitted a proposal for $24M to the Canada Foundation for Innovation - Innovation Fund.

INCLUSIVE SPINAL PAIN DATABASE

Our Spinal Rehabilitation Registry (SPINA) – developed with support from BJI's Common Spine Disorders Think Tank, CANSpine Patient Partner Advisory Group, and diverse local rehabilitation clinicians will be more comprehensive and inclusive thanks to BJI Grand Challenge Program funding.

An interdisciplinary team of patient partners, clinicians, and researchers will be going mobile using the 'BJI BioBus' to collaboratively collect biological data from populations often excluded from studies due to accessibility issues – such as low-income, under-housed, rural or remote, incarcerated, and immigrant communities. This project will generate a vast database of information on key biological markers linked to spine pain and functional disability. This is instrumental in advancing research excellence in this area to benefit society as a whole.

Co-hosted a Research Engagement Collaborative Alliance with Partners (RECAP) event bringing together 46 researchers, clinicians, industry leaders, community organizations, and patient advocates to build partnerships to improve care for individuals living with neck and back pain.

Collaboration among experts from: Western, St. George's University (UK), Macquarie University (Australia), and Radboud University (The Netherlands).

PRELIMINARY OUTCOMES:

- Submitted a $150K NSERC Research Tools and Instruments Grant application.
- Preparing to submit a Canadian Institutes of Health Research Project Grant.
- Collaborating with University Advancement to fundraise for the BioBus.

STEM CELL THERAPY FOR BACK PAIN

The causes of back pain are complex. They are often associated with degeneration of the intervertebral discs in the spine. Despite significant impact on Canadians and burden on health care and socioeconomic systems, there are no disease-modifying treatments available.

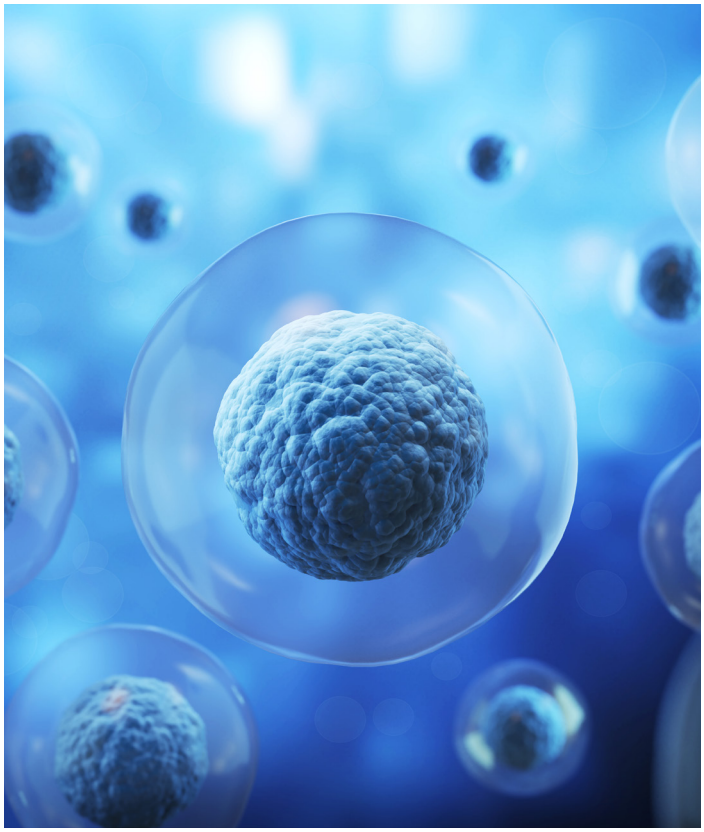
The goal of this BJI Grand Challenges Program-funded project is to develop a novel biomaterials platform to deliver "designer" pro-regenerative stem cells to intervertebral discs as a therapy to restore function.

Our diverse interdisciplinary team is composed of local and international experts in spine biology, biomedical engineering, chemical engineering, and regenerative medicine. Team-based activities will incorporate essential knowledge and skills between three institutions.

By evaluating various materials and cell combinations, we aim to find the key to maximizing the therapeutic effect that will restore disc function – thereby reducing or eliminating back pain.

"The BJI Grand Challenges Program grant provides us with funding that has been essential to solidify our multi-institutional collaboration and perform key pilot animal experiments, biomaterial characterization, and exchanges for trainees to travel between universities for data collection and knowledge exchange."

– Cheryle Séguin,
Principal Investigator



Collaboration among experts from: Western, Queen's University, Cedars-Sinai Medical Center (USA).

PRELIMINARY OUTCOMES:

- Applied for a $960K Canadian Institutes of Health Research Project Grant.
- Applied for a $270K Stem Cell Network Grant.

SAFE MOBILITY REHABILITATION

Participation in play, sports, work, and daily activities carries inherent risks. Situational awareness is the ability to sense, think, and act safely to reduce these risks. Yet, it is rarely taught in rehabilitation programs and remains understudied.

Measuring and improving situational awareness in real-world settings is a complex challenge that no single tool, researcher, or perspective can solve alone.

This BJI Grand Challenges Program-funded project seeks to better understand how to assess and train situational awareness that supports safe mobility in activities vital to health and quality of life. Our interdisciplinary team began with an environmental scan of tools and definitions across disciplines.

Next steps include identifying outcome measures and working with partners to launch studies in rehabilitation settings.

This project builds on work initiated by the CAMELOT team (Communication- and Mobility-focused, Equity-driven, Literacy-enabled, Outcomes-oriented Technologies), funded by a Western Research Interdisciplinary Development Initiatives grant.

Collaboration among experts from: three rehabilitation programs (Physical Therapy, Occupational Therapy, and Audiology), Engineering, Computer Science, and Sociology at Western and Memorial University of Newfoundland.

PRELIMINARY OUTCOMES:

- Submitted a $250K New Frontiers in Research Fund - Exploration application.
- Submitted a grant of $6.2M to the Canada Foundation for Innovation - Innovation Fund.

FUTURE MSK RESEARCH LEADERS

We welcomed 22 new trainees into the Collaborative Specialization in Musculoskeletal Health Research (CMHR) program this year. Our trainees come from 18 different departments to collaborate across disciplines in an interdisciplinary course-based and workshop training environment. This complements home program learning and introduces trainees to the value of other disciplines.

In addition, BJI awarded four new and renewed five graduate-level Transdisciplinary Research Awards for high-quality interdisciplinary trainee-led research projects. Awardees are supported by co-mentors from different disciplines to enhance collaboration and research impact. BJI also funded six of the 14 trainees in the CMHR Summer Undergraduate Program.

Read trainee profiles on our website: boneandjoint.uwo.ca

FEATURED TRAINEE: Jennifer Villeneuve

Degree: MESc Biomedical Candidate, BESc Mechatronics & Biomedical Engineering

Research Project Focus: Specializing in musculoskeletal biomechanics and medical imaging.

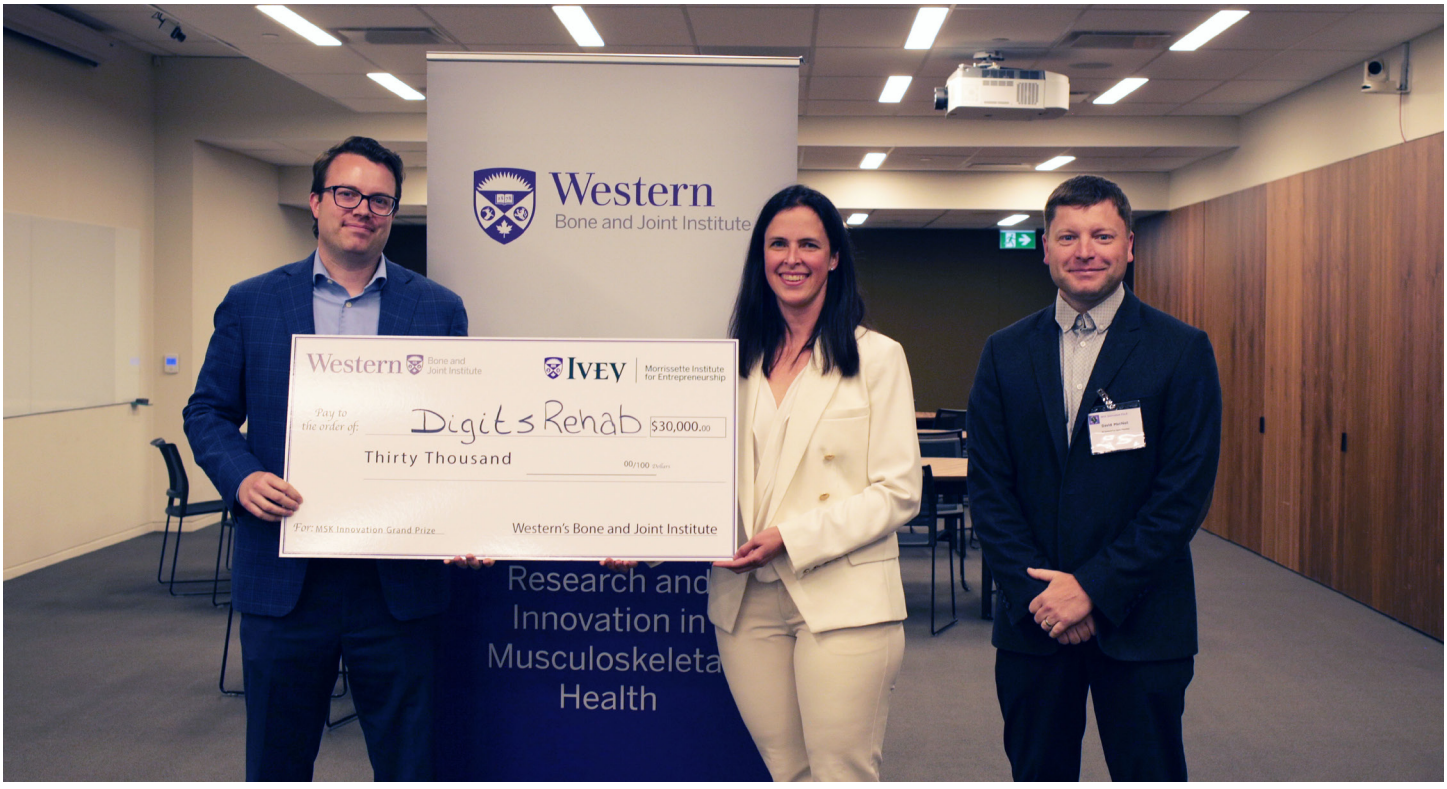
"I have enjoyed the sense of community being part of BJI & CMHR. I have learned a lot through the required courses and with BJI funding for my undergraduate summer research project, I really enhanced my research skills. Now in my Master's, I am working on a kinematic coordinate system for the carpal bones of the wrist. I collaborate with Dr. Crisco at Browns University who provides guidance in work not currently done in my lab. I also work alongside a PhD student in Australia looking at various statistical models. I feel the diversity of CMHR students provides me with a variety of viewpoints to improve my research. I look forward to future collaborations."

INNOVATION & BUSINESS ACUMEN

The DIGITS Rehab platform leverages technology to improve remote arm and hand rehabilitation using smartphones to educate, provide exercise programs and games, and track patient progress. It also builds a patient-first virtual community for support. Digits Rehab Inc.'s co-founder, Dr. Caitlin Symonette, leveraged BJI's MSK Innovation Competition prize into $20,000 of additional FedDev Ontario funding within months. "The Bone and Joint Innovation Competition was very helpful. I was connected with TechAlliance, and I've been working with them ever since." said Symonette.

Building on the momentum provided by BJI, the team went on to work with IPON (Intellectual Property Ontario), which opened doors to critical IP support. The combination of these successes and ongoing support will help bridge academic research to real-world applications.

Our MSK Innovation Competition includes workshops, mentoring, and final pitch feedback from expert judges. Together, these elements prepare teams for ongoing success post-competition.



INSTITUTE-FUNDED INITIATIVES

Special call: MSK Health Data Grants Competition

Certifications are required to work with administrative health data housed in the ICES Ontario (formerly the Institute for Clinical Evaluative Sciences) registry. This special BJI call helped to expand our capacity to conduct population-level research. We had a 2.5x increase in our number of certified ICES Scientists.

IC/ES Data Discovery Better Health

Think Tank Progress Update

Interdisciplinary think tank collaborations continue to receive in-kind support from the institute as teams prepare various project proposals to: expand the diversity of their team, expand partnerships, and build on previous success. The 'Common spine disorders' team evolved and refined their work, landing two BJI Grand Challenge Program awards. The 'Bone health across the lifespan' team and the 'Microbes in MSK health' think tanks also submitted proposals to various competitions.

From High-risk to High-reward

Our BJI Catalyst Awards Program, open from 2015 to 2023, supported early-stage high-risk ideas for 40 interdisciplinary teams (~$25K per team). These teams have since secured more than $10M of additional funding.

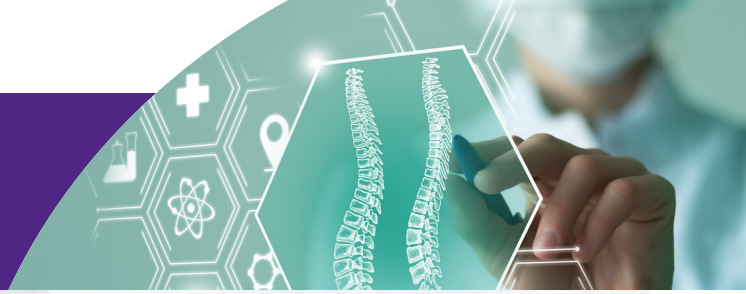
Strength Through Research Partnership

BJI members contributed to the development of Western's new Research Engagement Collaborative Alliance with Partners (RECAP) program, which supports anyone interested in learning about authentic and diverse partnerships for greater research impact. Both BJI faculty and partners participated on the RECAP leadership committee, program development working groups, and co-created educational modules, vignettes, and case studies. Cathy Hofstetter, BJI patient partners and chair of BJI's external advisory council, led an inspiring panel at the RECAP launch event.

Panelist teams – Alison Rushton (BJI member) and Maggie Perquin (Spinal Patient Partner Advisory Committee), Yolanda Hedberg (BJI member) and Teaghan Wellman (Cypher Environmental Ltd.), and Jason Gilliland (BJI member) and Sarah Merritt (Old East Village Community Association) – shared stories about the value of their research partnerships. BJI was also the first to co-host an event to pilot the RECAP materials and put its guiding principles to work.

Visit the RECAP – YouTube channel to view the panel and short case studies.

LOOKING AHEAD

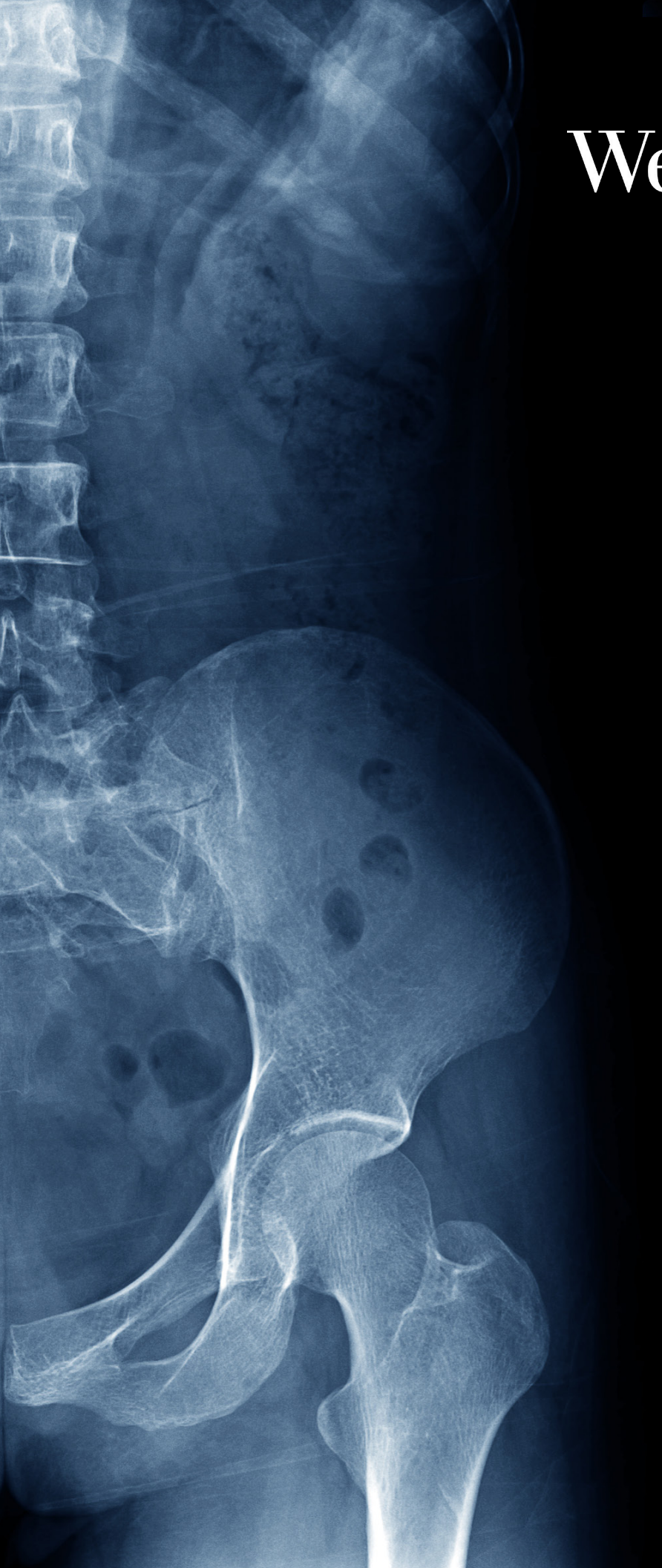


The Bone and Joint Institute has built a culture of intensive interdisciplinary collaboration, exemplified by how we have seeded new teams through our BJI Catalyst Grants Competition and co-mentored BJI Transdisciplinary Research Awards for trainees. These programs, our showcase events, and think tank meetings bring people together to work on novel research ideas.

In 2024, BJI has realized an even greater ambition through the launch of the BJI Grand Challenges Program. Leveraging our collaborative culture and innovative research, this program works with more established teams in an outward-facing manner to build national and international partnerships to tackle the biggest issues in musculoskeletal health.

All of us at BJI are excited to see the impact our researchers and their partners are going to make in the coming years. We invite you to visit our website and reach out to our team to learn more about ways to engage in interdisciplinary musculoskeletal health research.

Matthew Teeter
Director, Bone & Joint Institute



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To learn more, visit our website:

boneandjoint.uwo.ca