

BMRC Hosts Inaugural Research Symposium: *A Day of Discovery, Collaboration, and Celebration*

On Friday, Sept. 5, 2025, the Orland Bethel Family Musculoskeletal Research Center (BMRC) hosted its first annual BMRC Research Symposium, bringing together nearly 160 faculty, trainees, staff, and students.



The full-day event highlighted the depth and diversity of musculoskeletal research across the clinical and basic sciences, while also celebrating collaboration, mentorship, and future directions in the field.

The day began with opening remarks from **Joon Y. Lee MD**, founding director of the BMRC, and **MaCalus V. Hogan, MD, MBA**, David Silver Professor and chair of the Department of Orthopaedic Surgery at the University of Pittsburgh School of Medicine, followed by presentations from



BMRC Core Labs. Morning sessions focused on clinical research, featuring talks on carpal tunnel outcomes, sarcoma registries, shoulder biomechanics, and diabetic fracture healing models. Basic science presentations later in the day included innovative work on in vivo models of spine instability, joint-on-a-chip systems for studying osteoarthritis, and advanced imaging approaches to understand degeneration and repair.

"This inaugural BMRC Symposium marks an important milestone for the Department of Orthopaedic Surgery and the University of Pittsburgh. It reflects not only the strength and diversity of our research team, but also our collective commitment to advancing discovery, collaboration, and mentorship. I believe this event demonstrates the tremendous potential we have to shape the future of orthopaedics and improve the lives of our patients," says Dr. Hogan.

A mid-morning special session, cohosted by the Pittsburgh Center for Interdisciplinary Bone and Mineral Research (PCIBMR), featured **Giuseppe Intini, DDS, MS, PhD**, discussing skeletal adaptation during spaceflight and its implications for bone disease and regeneration.

The keynote address was delivered by **Marc Schulz, PhD**, professor of psychology at Bryn Mawr College, coauthor of *The Good Life*, and associate director of the Harvard Study of Adult Development. Dr. Schulz's lecture traced findings from the longest-running longitudinal study of adult well-being and emphasized the powerful role of close relationships in fostering long-term health, resilience, and purpose.

The afternoon included a poster session showcasing 40 abstracts across clinical, translational, and preclinical areas. Topics included AI-based imaging diagnostics

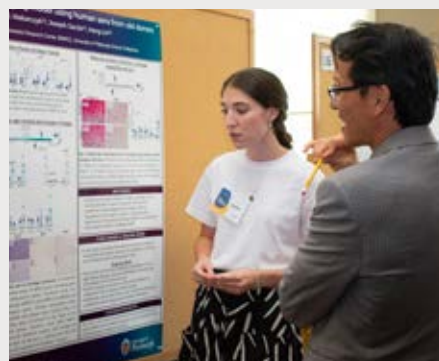


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BMRC Hosts Inaugural Research Symposium *(continued)*

and biofilm therapeutics to tendon repair models, spinal inflammation, cartilage degeneration, and musculoskeletal aging. Five poster presenters were recognized with awards:

- **Predoctoral Award, Preclinical Research:** Sophie Hines and Meagan Makarczyk
- **Postdoctoral Award, Preclinical Research:** Samantha Costa
- **Predoctoral Award, Clinical Research:** Lidya Canturk
- **Postdoctoral Award, Clinical Research:** Lawrence Garvin II



Later sessions spotlighted research from the 2024–2025 BMRC/ORS fellows, who presented work on topics, including neuromuscular contracture, spinal immune

dynamics, craniofacial development, osteoarthritis inflammation, and high-resolution imaging of disc microstructure.

The event concluded with closing remarks, an awards ceremony, and a well-attended reception. Planning is already underway for the 2026 BMRC Research Symposium.

“It is deeply gratifying to see our vision come to life in this first annual symposium. Bringing together so many talented clinicians, scientists, and trainees in one space underscores the collaborative spirit that defines the BMRC. I am excited to see how this event grows through the years,” says Dr. Lee.

Ferguson Lab Trainee Spotlight:

Julia Chagas, MD, International Postdoctoral Fellow

Julia Chagas, MD, is a trained orthopaedic spine surgeon from Brazil who came to the University of Pittsburgh in early 2025 to begin a two-year postdoctoral fellowship in the Ferguson Laboratory for Orthopaedic and Spine Research.



Dr. Chagas completed her medical degree in Brazil at the UNIFASCISA in Campina Grande, and orthopaedic residency and research fellowship at Hospital Israelita Albert Einstein in São Paulo, where she developed a clinical focus in spine surgery and was later invited to participate in a research fellowship investigating exosome-based therapies for intravertebral disc degeneration.

That research experience, which was her first exposure to basic science lab work, introduced her to cellular and molecular techniques and created a deeper interest in conducting orthopaedic research. Through mentorship connections with a former Ferguson Lab trainee, **Pedro Pohl, MD, PhD**, Dr. Chagas was introduced to Ferguson Lab Co-Directors **Nam Vo, PhD**, and **Gwendolyn Sowa, MD, PhD**, and was subsequently invited to join the lab and continue her scientific training as a postdoctoral research fellow where she is now working to understand the biological mechanisms that may underlie chronic back pain in aging women, an area of basic science research that

remains underexplored despite its high clinical relevance.

“Research is not very common in orthopaedic surgery in Brazil, and basic science research even less so,” says Dr. Chagas. “But I had the opportunity to learn how to isolate exosomes, culture cells, and perform assays. I realized how much I enjoyed the scientific process.”

Exploring the Hormonal Effects on Intravertebral Discs, Degeneration, and Pain

Dr. Chagas’s primary research project in the Ferguson Lab is studying how hormone replacement therapy (HRT), specifically estrogen and progesterone supplementation, may affect intervertebral disc degeneration and the experience of pain in women as they age. Using both animal models and human cell cultures, Dr. Chagas is testing estrogen alone versus combined estrogen–progesterone while also assessing the roles of luteinizing hormone (LH) and follicle-stimulating hormone (FSH).

Her project builds on prior studies showing that estrogen replacement can reverse damage in articular chondrocytes. Dr. Chagas is extending this work to the spine, examining whether similar regenerative or protective effects might be achievable in intravertebral disc cells. Dr. Chaga’s research uses in vitro analyses using human disc cells, as well as animal studies designed to test different hormone formulations and combinations.

In reviewing the literature for a menopause and low back pain review, Dr. Chagas found a long gap in publications after early work on the subject was conducted in the 1960s and 1970s, followed by renewed interest that has begun to examine associations between menopause and low back pain independent of osteoporosis.

“The literature shows that women tend to experience and feel greater levels of pain than men, in general, but also as they age,” Dr. Chagas says. “One of the causes may be hormonal imbalance during perimenopause and menopause.”

While the clinical use of HRT in managing gynecologic symptoms of menopause is well established in the literature, much less is known about its possible effects on spinal health or intervertebral disc-related pain. In surveying the literature to support a planned review manuscript, Dr. Chagas identified a sizeable gap.

“There were a handful of studies from the 1960s and 1970s, but then almost two decades passed with little research in this area. It is only more recently that the field is beginning to recognize again this connection and what it may mean clinically.”

Collaborative Research and Mentorship Roles

In addition to her primary research project, Dr. Chagas also is contributing to the lab’s LB3P (Low Back Pain: Biological, Biomechanical, Behavioral Phenotyping)* clinical research consortium, which is a multi-year, multicenter National Institutes of Health-funded effort studying the nature of, causes, and phenotypes of low back pain. One area of current exploration involves the use of heart rate variability as an easily accessible biomarker (collected from wearable devices or monitors as a potential predictor of pain risk or

autonomic dysregulation in certain patient subgroups.

“We are trying to understand whether measuring heart rate variability in patients with and without low back pain could help us detect early signs or triggers of pain,” Dr. Chagas says. “We want to know if those physiological changes are correlated with how pain develops or progresses.”

Beyond her clinical lab work, Dr. Chagas is mentored a visiting medical student from Italy through a summer research experience.

“When you teach someone, you also learn,” Dr. Chagas says. “It completes the cycle of learning — first you see it done by someone, then you do it yourself, and then you teach it. That’s how it becomes part of you.”

Working in Pittsburgh and Future Career Plans

Adjusting to life in Pittsburgh after living in São Paulo, Brazil, a city of more than 20 million people, was its own learning experience. When Dr. Chagas arrived in Pittsburgh it was winter, and it was the first time she had seen and experienced snow. Despite the cold, the city, the university, and the Ferguson Lab gave her a warm welcome.

“I feel like Pittsburgh hugged me when I got here,” Dr. Chagas says. “I am incredibly appreciative of the opportunity and the trust that Dr. Vo and Dr. Sowa have showed me. The lab is such a collaborative place, and everyone has been generous and supportive. It’s been a very different, meaningful time in my life so far and I’m looking forward to my second year of fellowship.”

Dr. Chagas’s goal is to build a career that combines clinical practice, research, and teaching.

“I no longer see myself solely as a physician. I want to be a physician-scientist, and a professor someday. My dream is to stay here in the United States, but I also know that sometimes you have to go where the opportunity takes you,” Dr. Chagas says.

Her time in the Ferguson Lab so far has expanded her scientific expertise and helped her reimagine what a career in medicine can look like.

“I never imagined I would be here doing this work. But now that I am, I know I am doing what fulfills me the most.”

*The University of Pittsburgh Low Back Pain: Biological, Biomechanical, Behavioral Phenotypes (LB3P) Mechanistic Center of the Back Pain Consortium Research Program (BACPAC), part of the National Institutes of Health Helping to End Addiction Long-term Initiative administered by the National Institute of Arthritis and Musculoskeletal and Skin Diseases (NIAMS) of the National Institutes of Health (NIH)

BMRC 2025 Summer Student Research Program Recap

In August 2025, the Orland Bethel Family Musculoskeletal Research Center (BMRC) wrapped up its 2025 Summer Student Research Program (SSRP), a nine-week training experience for undergraduate and medical students interested in musculoskeletal research.

Each year, the SSRP offers students from the University of Pittsburgh and institutions nationwide a hands-on opportunity to work in BMRC labs. Participants are paired with faculty and trainees for daily lab work, gaining experience in experimental design, data analysis, and the day-to-day realities of the research process. Weekly seminars led by BMRC Core Scientists complement the lab component and provide additional training in scientific communication and professional development.

The program concluded with the annual Poster Presentation Day, where students presented their research to BMRC investigators, mentors, and invited guests, including members of the Bethel Family. Many participants cited the independence they gained in the lab and the collaborative culture of the BMRC as defining aspects of their experience. Several will continue their work in BMRC-affiliated labs this fall.

“Our goal is to provide meaningful research experiences, but what students gain goes beyond the lab work. They leave with skills in interpreting scientific literature, experimental troubleshooting, and science communication that will serve them wherever their path leads,” says Laurie Dearolf, PhD, operations manager for the BMRC.



Poster topics reflected the diversity of research across the Center and included projects in:

- Cell signaling
- Bacterial biofilms
- Tissue regeneration
- Biomechanics
- Bacteriophage therapy
- Assay development.

To learn more, visit www.bethel.pitt.edu.

ABOUT THE FERGUSON LABORATORY FOR ORTHOPAEDIC AND SPINE RESEARCH



The Ferguson Laboratory for Orthopaedic and Spine Research at the University of Pittsburgh studies the complex developmental mechanisms, etiologies, and basic biology behind intervertebral disc degeneration (IDD), and it works to develop biological, biomechanical, and cell-based therapies for IDD. Another major endeavor of the Ferguson research program is studying the deep phenotype of chronic low back pain through collection and processing of large patient datasets. Leading the laboratory's multidisciplinary research efforts are co-directors Joon Y. Lee, MD, FAOA; Gwendolyn A. Sowa, MD, PhD; and Nam V. Vo, PhD.

The Ferguson Laboratory explores distinct but complementary research areas to dissect and clarify the physiological processes that lead to disc degeneration. Dr. Vo leads the lab's efforts studying the contribution of aging on IDD and loss of disc extracellular matrix (ECM) proteoglycans, with a special focus on cellular senescence and autophagy in regulating aggrecan homeostasis. Dr. Sowa oversees investigations involving the mechanisms of mechanical strain on disc cell metabolism, with an emphasis on how mechanical strain-induced inflammation controls ECM collagen expression and breakdown. As a practicing orthopaedic surgeon, Dr. Lee explores minimally invasive treatment of trauma and conditions in the spine.

The lab is named in honor of Albert B. Ferguson Jr., who held the Silver Chair of Orthopaedic Surgery at the University of Pittsburgh from 1953 until his retirement in 1986. Dr. Ferguson was a visionary force behind the evolution and growth of the clinical, research, and training programs of the University of Pittsburgh Department of Orthopaedic Surgery into the internationally respected program of excellence it is today.

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