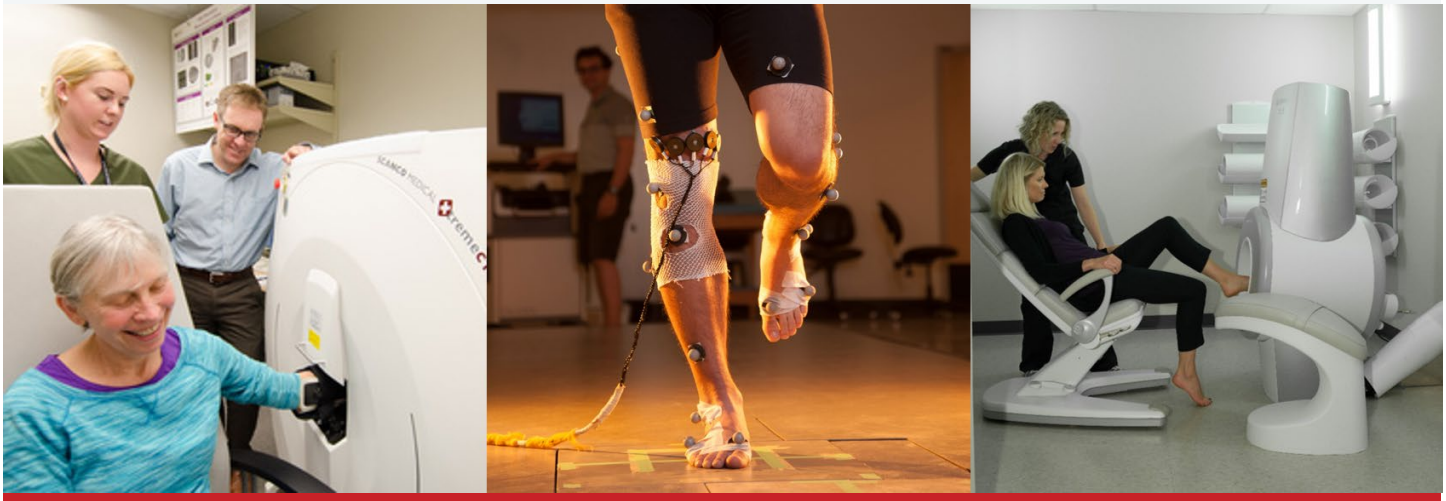
McCAIG INSTITUTE
FOR BONE AND JOINT HEALTH



Core Facilities: Research Support & Validation Testing

UNIVERSITY OF CALGARY
CUMMING SCHOOL OF MEDICINE

Mobility for Life.

Table of Contents

The McCaig Institute for Bone & Joint Health

The McCaig Institute is one of seven research institutes in the Cumming School of Medicine at the University of Calgary. It is one of the most comprehensive musculoskeletal research centres in Canada with expertise spanning basic discovery to clinical implementation and health systems improvement. Using a collaborative research approach in a multidisciplinary environment, we focus on improving the diagnosis, treatment and prevention of bone, muscle and joint diseases and turning evidence-based research into real-world solutions.

To expedite the implementation of these solutions into practice and make treatments available to help patients, the McCaig Institute has established a clinical research facility, the Centre for Mobility and Joint Health (MoJo). This state-of-the-art facility connects patients, physicians, and researchers from across the province, helping to generate evidence to inform policy, practice, and treatment for patients and community members in Alberta and beyond. The facility brings together powerful technologies including biomarker and motion analysis as well as advanced medical imaging equipment, making the McCaig Institute the only bone and joint research institute in the world with the capacity to assess an individual's bone and joint health on every level. This facility is also available to support research, clinical implementation, and commercialization of innovations spanning all areas of health that can utilize these advanced platforms.

In addition to this imaging facility, the McCaig Institute has a comprehensive biomechanics lab to support the next generation of biomechanics researchers in taking their programs to the next level. A full-time biomechanics technician with three decades of expertise in protocol development and testing is available to support research projects within this facility and ensure high quality, accurate data collection and analysis.

For any questions regarding research and commercial opportunities in the McCaig Institute, please contact the McCaig Institute.

Email: mccaig@ucalgary.ca

Phone: (403)210-6774

Website: https://mccaig.ucalgary.ca/

Core Facilities: Biomechanics Lab

858 Mini Bionix

The axial/torsional configuration of the Bionix tabletop system enables biaxial testing, controlling torsional moments up to ±100 N·m and total rotations of 270°. It is excellent for testing the durability and wear properties of components such as knee, hip and spine implants. When paired with specialized subsystems and accessories, it is capable of performing both simple and complex kinematics studies of skeletal tissue and orthopaedic constructs.

Technical Specifications:

- Displacement up to 100 mm
  - Tolerance +/- 1% of Reading
- Rotation +/- 140 deg.
  - Tolerance +/- 1% of Angle 10% to 100%
  - Tolerance +/- 0.1% < 10% of Angle
- Torque +/- 100 Nm
  - Tolerance +/- 1% of Applied Torque
- Tension / Compression +/- 10,000 N
  - Tolerance +/- 1% of Applied Force

Sample Project:

- Human femur and tibia radial fractures under compression

MTS_1 & MTS_2

Currently MTS_ 1 & MTS_2 both have two actuators that are configured in a horizontal and vertical orientation. However either system can borrow the other two actuators and configure them to best suit a four actuator test.

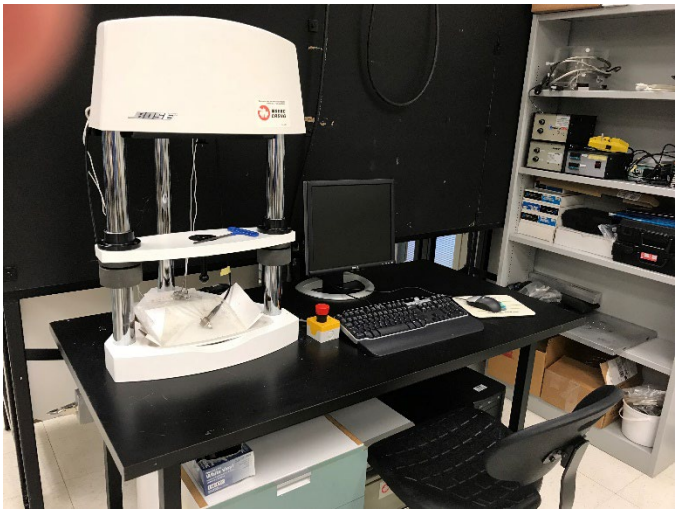
Technical Specifications:

- Displacement up to 100 mm
  - Tolerance +/- 1% of Reading
- Tension / Compression up to +/- 10,000 N
  - Tolerance +/- 1% of Applied Force
- Current load cells: 10,000N, 5,000N, 1,000N, 500N, 225N, 100N

Sample Projects:

- Rabbit knee capsule stiffness (single horizontal actuator)
- Rabbit MCL strength (single vertical actuator)
- Rat Achilles tendon strength (single vertical actuator)
- Sheep MCL strength (single horizontal actuator)
- Surgical Table strength (single vertical actuator)

Bose ElectroForce 3220



The ElectroForce 3220 test instruments feature a 225 N maximum force. With the versatility of static to 300 Hz frequency response, the table-top configuration is adaptable to a variety of biomedical research and engineered materials test applications, creep under dynamic loading, fatigue, stress relaxation and special environments (water bath).

Technical Specifications:

- Displacement up to 13 mm
    - Tolerance +/- 0.5% of Reading
- Load up to 225N
    - Tolerance +/- 0.5% of Reading
- DVE (Digital Video Extensometer)
- Dynamic testing up to 300 Hz
- Cryo grips
- 37° C saline bath
- Current load cells: 225N, 45N, 250gm

Sample Projects:

- Tuna Tendon strength
- Aorta strength (axial and circumferential)
- Plastics strength
- Skin strength
- Surgical suturing methods for tissue damage

Contact Information

For more information about equipment or fees associated with services in the Biomechanics lab, contact:

Kent Paulson, Biomechanics Technician:
paulson@ucalgary.ca

Additional Information:
https://mccaig.ucalgary.ca/research/biomechanics-lab

Core Facilities: Centre for Mobility & Joint Health (MoJo)

Digital Radiography (X-Ray)

GE Discovery XR 656

Technical Specifications:

- Volume RAD
- Dual energy subtraction
- Auto image paste

Use:

- As per standard musculoskeletal applications

Magnetic Resonance Imaging (MRI)

GE Optima 430s 1.5T

Technical Specifications:

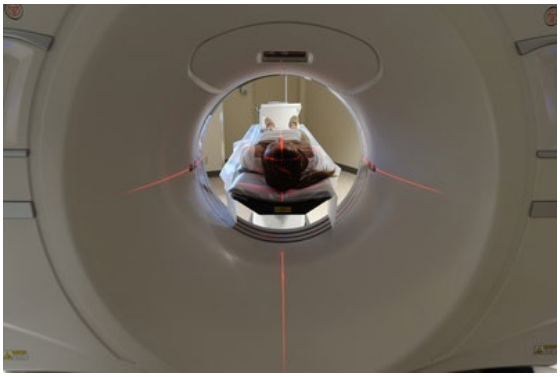
- Extremity scanner
- High signal-to-noise ratio
- Multiple coils for specific joint

Use:

- Elbow, hand, knee, ankle
- Soft tissue imaging
- Bone lesions
- 3D imaging

Computed Tomography (CT)

GE Revolution HD GSI



Technical Specifications:

- Gemstone Spectryal Imaging (140 kV and80 kV fast switching)
- VEO for ultra low dose image reconstruction

Use:

- 3D modeling using low dose protocol
- Material decomposition, e.g. uric acid in gout

Ultrasound

GE Logiq S8

Technical Specifications:

- Multiple transducers
- Examination rooms
- Elastography

Use:

- As per standard musculoskeletal applications

High-Resolution Peripheral Quantitative CT

XtremeCT (I and II)

Technical Specifications:

- Extremity scanner
- Hands, wrists, ankles, and knees
- 61 µm resolution
- Low dose

Use:

- Bone quality and micro-architecture

Dual-Energy X-Ray Absorptiometry (DXA)

GE iDXA

Technical Specifications:

- Bone mineral density
- Body composition/lean mass
- Trabecular bone score (TBS)

Use:

- As per standard musculoskeletal applications

Bi-Planar X-Ray (EOS)

EOS

Technical Specifications:

- Simultaneous bi-planar x-ray
- High geometric accuracy
- Low radiation dose for specialized pediatric application

Use:

- Surgical planning and follow-up
- Skeletal alignment assessment
- Scoliosis

Contact Information

For more information about equipment or fees associated with services in the MoJo, contact:

Katrina Koger, Manager, Centre for Mobility and Joint Health (MoJo): Katrina.koger@ucalgary.ca

General Inquiries: mojo@ucalgary.ca

Current Rates: https://mccaig.ucalgary.ca/mojo/facility-services/mojo-fees-services