



PLEASE MUTE YOUR MICROPHONES DURING THE
PRESENTATION

Welcome to the
Meetings for Majors in
Biological Engineering &
Biomedical Engineering

UNIVERSITY
of GUELPH

IMPROVE LIFE.

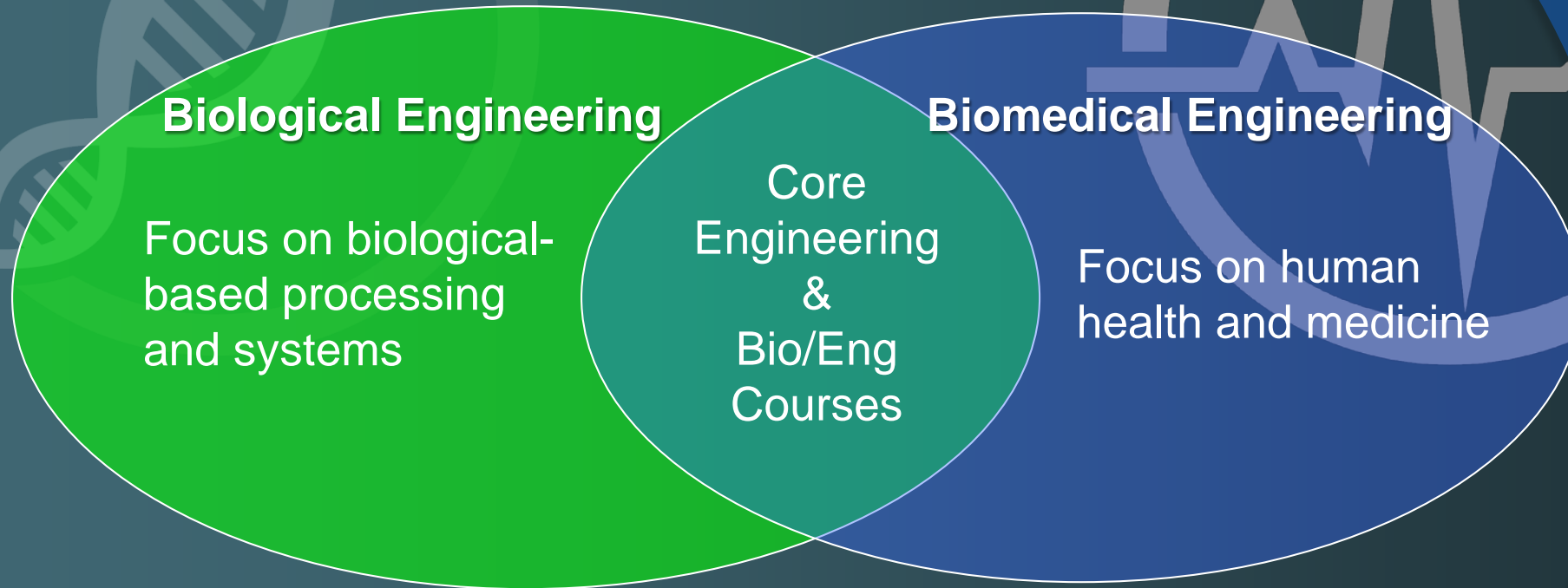


**Welcome to
Biological Engineering
and Biomedical Engineering!**

UNIVERSITY
of GUELPH

CHANGING LIVES
IMPROVING LIFE

Biological & Biomedical programs

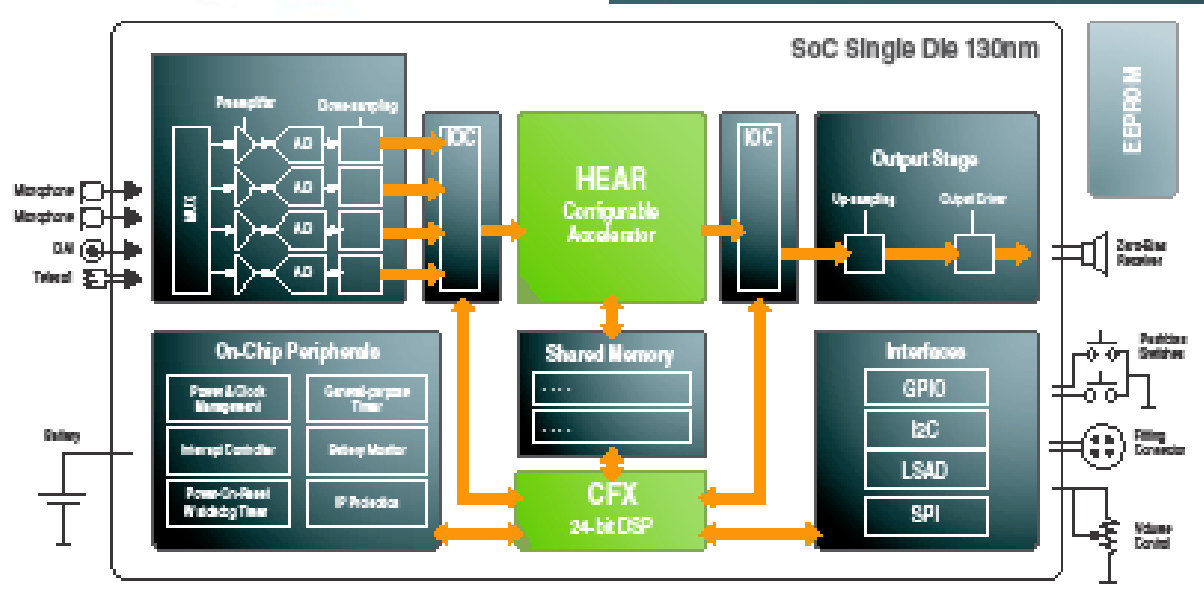


REQUIRED CORE		
BIOE	COMMON	BME
Discovering Biodiversity (optl) Intro Molecular & Cellular Bio (opt) Intro to Biochemistry Biological Eng Systems I Biological Eng Systems II Bio-Process Engineering Bioreactor Design	Biological Concepts of Health Biomaterials Bio-instrumentation Design	Engineering Mechanics II Concepts in Human Physiology Biomed Comparative Anatomy Signal Processing Principles of Disease
ELECTIVES		
BIOE (association)	COMMON	BME (association)
Food Processing Eng Design (bioe) Digital Systems (ceng/esc) Microcomputer Interfacing (ceng/esc) Applied Fluids & Thermo (mech) Comp Fluid Dynamics (mech) Air Quality (enve) Water Quality (enve/wre) Solid & Hazardous Waste Mgmt (enve) Phys & Chem Water & Wastewater Treatment (enve/wre) Bio Wastewater Treatment (enve/wre)	Biological Eng Systems I (bioe core) Biological Eng Systems II (bioe core) Signal Processing (bme core) Medical Image Processing Bioreactor Design (bioe core) Optimization for Engineers Quality Control Assessment & Mgmt of Risk	Medical Imaging Modalities (bme) Biomedical Signals Processing (bme) Engineering Biomechanics (bme) Biomechanical Eng Design (bme) Electromagnetics in Biomedical Engineering (bme) Micro/Nano Scale Electronics (ceng/esc) Sampled Data Control Design (esc) Kinematics & Dynamics (mech) Robotic Systems (mech) Finite Element Analysis (mech)

Professor Bob Dony

- ◎ BIOE/BME Area Head
- ◎ Teaching
 - ENGG*3100 Design III
 - ENGG*4660 Medical Image Processing
- ◎ Research
 - Digital hearing aids
 - Medical image processing
- ◎ Profession: Former PEO President, Chair Accreditation Board





Professor Manick Annamalai



Teaching

- ENGG*4380 Bioreactor Design
- ENGG*3100 Engineering & Design III

Research

- Food Quality Assessment using Computer Vision Technology
- Food Processing and Product Development for Health and Wellness
- Natural Healthy substitute for White Sugar
- Processing and Product Development with Whole Grains
- Processing and Product Development with Pulses



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Professor Scott Brandon



Teaching

- ENGG*3170 - Biomaterials
- ENGG*4400 - Biomechanical Engineering Design
- ENGG*2100 - Engineering and Design II
- ENGG*6090 - Biomechanical Modeling and Simulation



Research

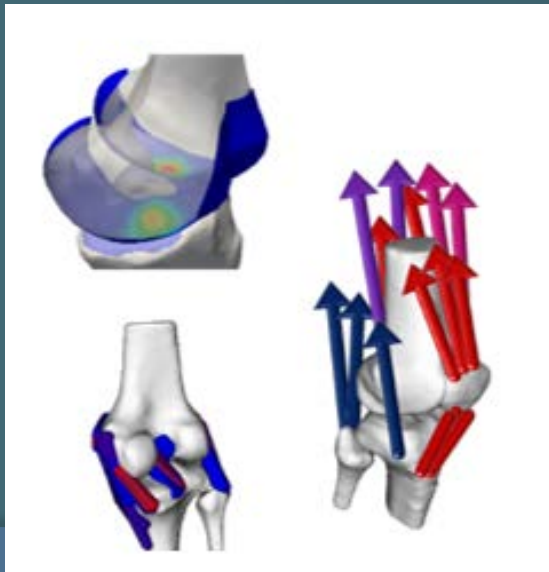
- Biomechanics – joint loads and injury (knee, spine)
- Knee braces – testing and design (passive, motorized)
- Movement Simulation – virtual surgery, virtual injury

Joint Loads

Motion Capture



Computational Models

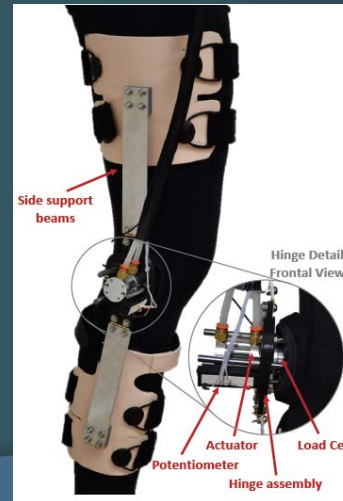


Braces

Passive (springs)

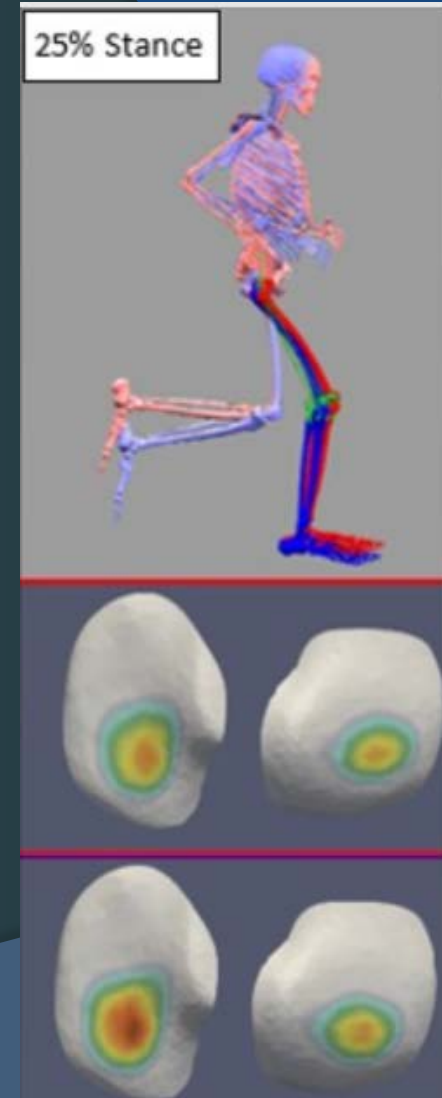


Active (motorized)



Simulation

Running Before/After ACL Tear



Professor Kevin Keener

Barrett Chair in Sustainable Food Engineering

⦿ Administrative

- Coordinate SOE Barrett Foundation Research Funding and Graduate Student Support Program

⦿ Teaching

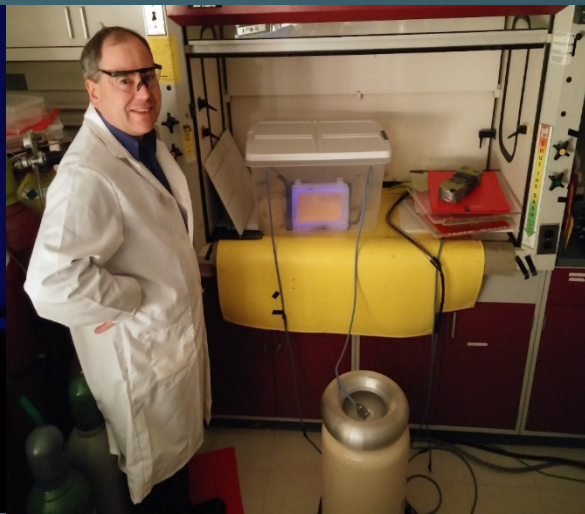
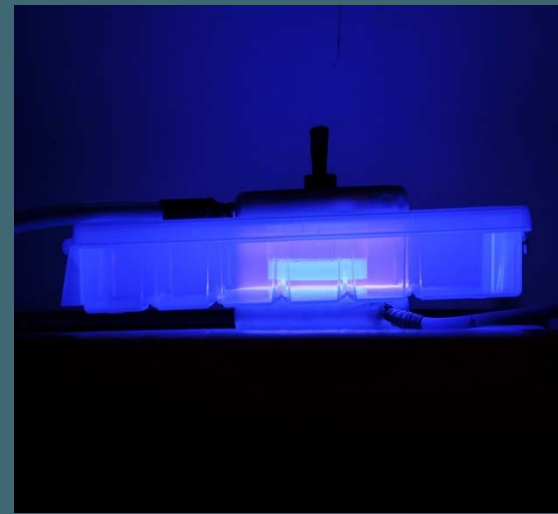
- ENGG*6090 (01) Novel Food Technologies for Sustainable Food Manufacturing

⦿ Research

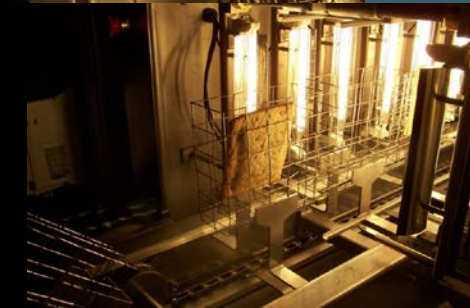
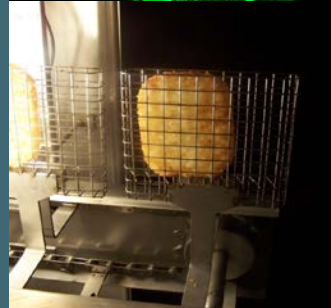
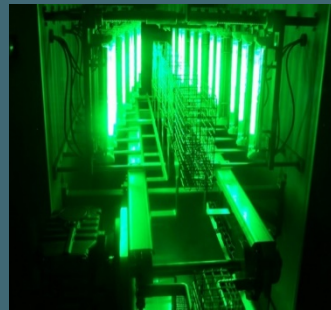
- Novel Technologies for food and bioproducts manufacturing

⦿ Profession: Fellow ASABE, Professional Engineer (USA)





Atmospheric cold plasma



Controlled dynamic radiant heating



Rapid cooling

Professor Huiyan Li



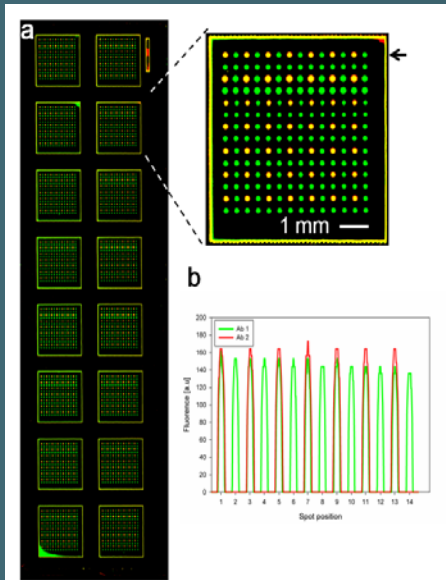
Teaching

- ENGG*4390 Bio-instrumentation Design
- ENGG*4060 Biomedical signals
- ENGG*6090 Micro-/Nano- Bioengineering

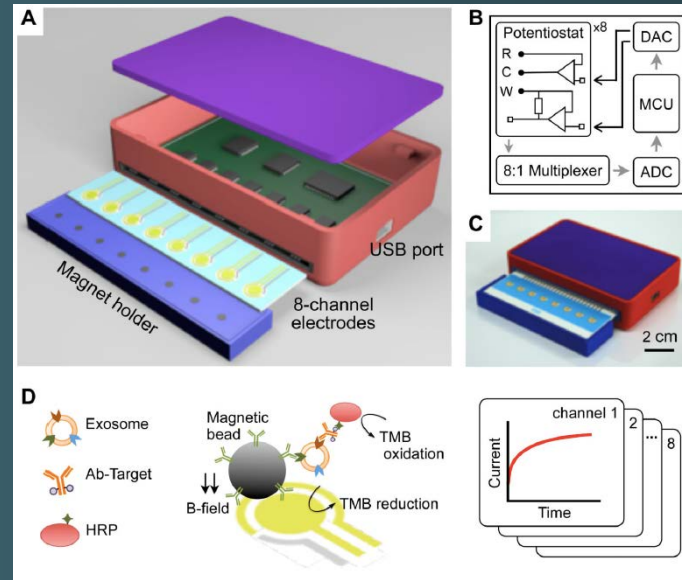
Research

- Biosensors and lab-on-a-chip for personalized medicine
 - Optical biosensors
 - Electrochemical biosensors
- Novel formats of bioassays with improved performance
 - Hydrogel-based
 - Paper-based

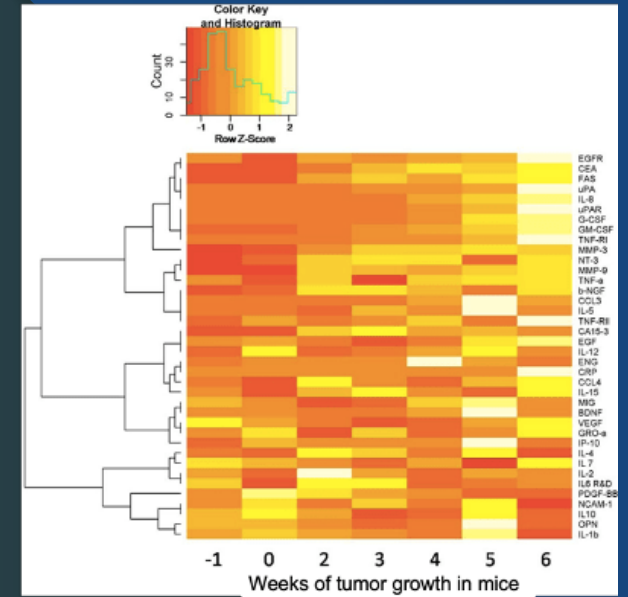
BioMed Innovation Lab



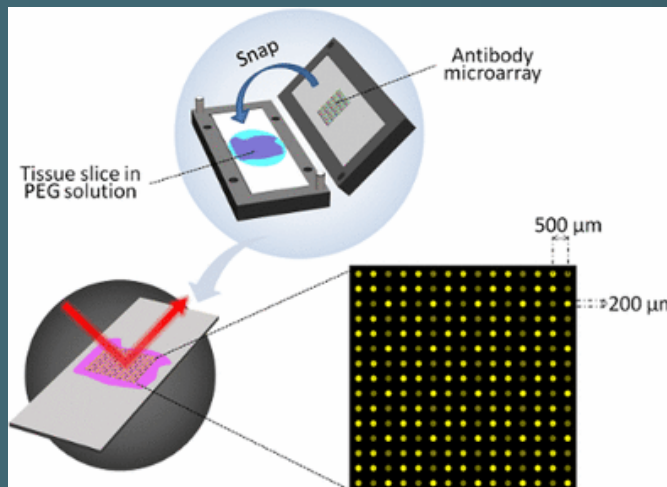
Optical microarray biosensor



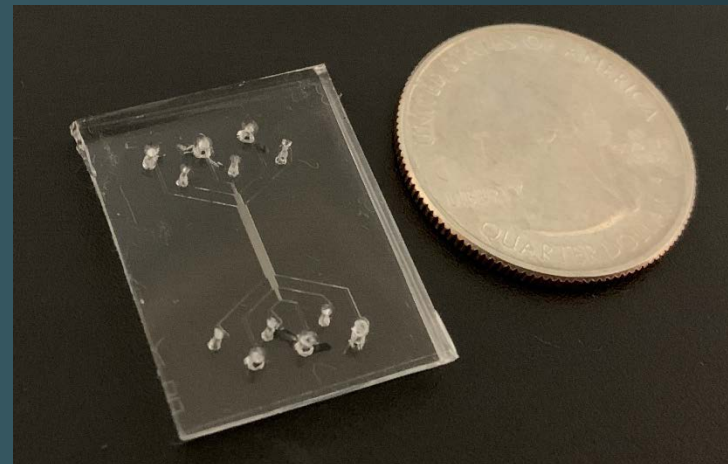
Electrochemical biosensors



Personalized cancer diagnosis



Lab-on-a-chip for protein detection



Microfluidic point-of-care devices

Professor Manju Misra

Teaching

- ENGG*6130 Physical Properties of Biomaterial

Research

- Bioplastics, Biobased Polymers and Polymer Blends
- Biocomposites (Natural Fibre Composites)
- Biobased Nanocomposites and Nanoblends
- Biomedical Applications of Bioplastics and Biocomposites



Innovation in Bioplastics & Biocomposites

Compostable rigid and flexible packaging, Automotive interior parts, Consumer products

BPI Certified Products Catalog

compostable coffee pod, Purpod100

Bio-bin

Flowerpot

World Patent Filed

BIOBLACKR™

USDA Certification for Bio-carbon: 99% new carbon –

USDA CERTIFIED BIOBASED PRODUCT PRODUCT 99%

BioCarbon-based film

Console box

Spare tire cover

Air duct controller

Coca Cola bottle packaging tray

3D Printed Podium

Compostable Mulch Film

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Professor Eran Ukwatta



Teaching

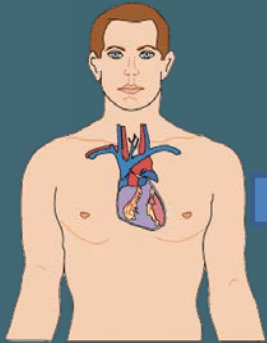
- ENGG*4040 Medical Imaging Modalities
- ENGG*3100 Engineering Design III

Research

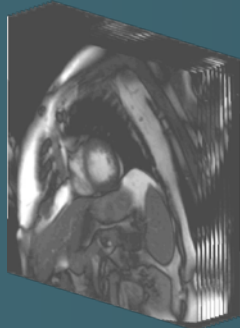
- Medical Image Analysis
- Image Segmentation and Registration
- Myocardial Tissue Characterization
- Machine Learning for Medical Imaging Applications
- Analysis of Digital Histopathology Images
- Computational Modeling of the Heart

Current Projects

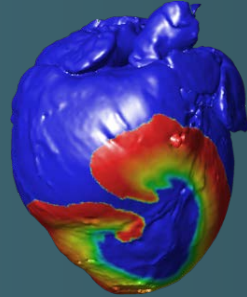
Patient



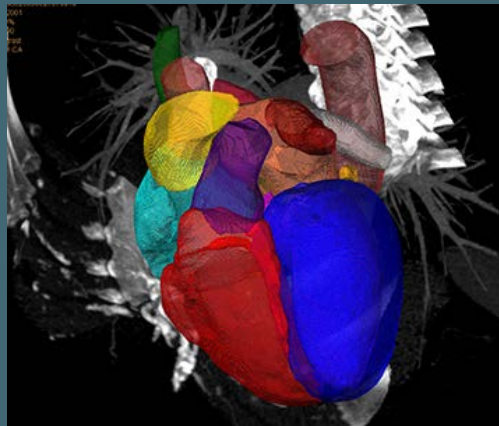
Imaging data



Patient-specific model

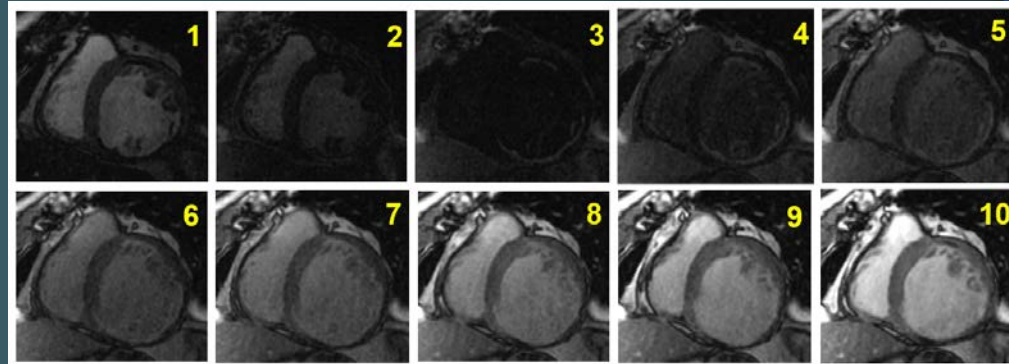


Atlas based segmentation of whole heart from MRI

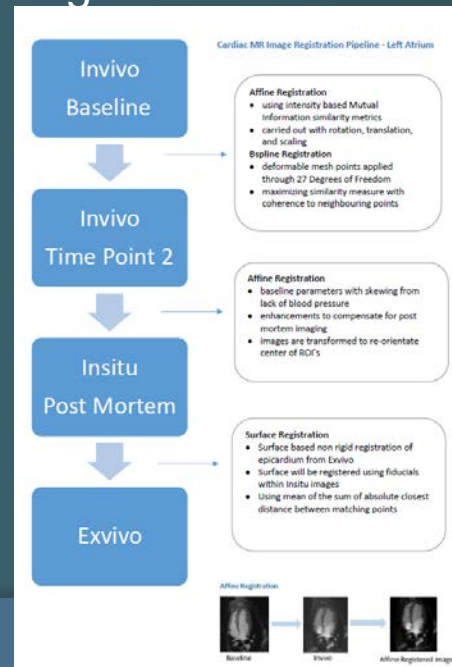


Collaborators: Western, Sunnybrook, UCalgary

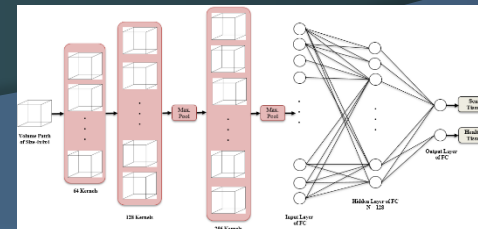
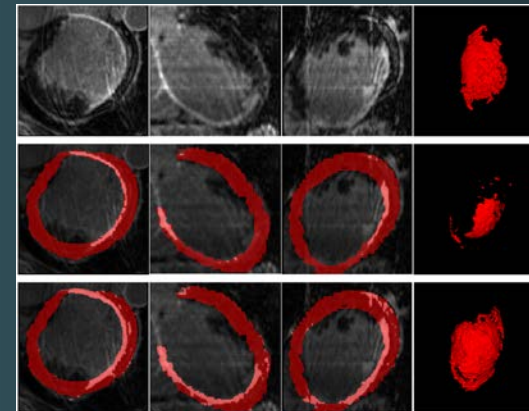
T1 mapping: New imaging methods for heart imaging



Registration of canine MRI images



Deep learning based method for scar segmentation



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Professor Chris Collier

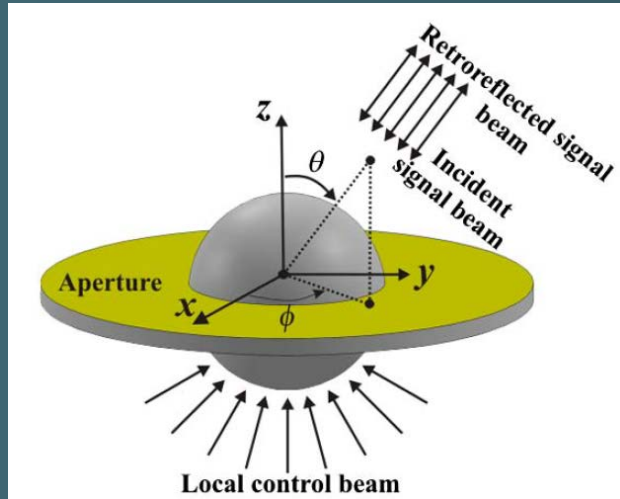


Teaching

- ENGG*2450 Electric Circuits
- ENGG 3270 Electromagnetics in Biomedical Engineering
- ENGG*6090 Bio-Optics and Bio-Photonics

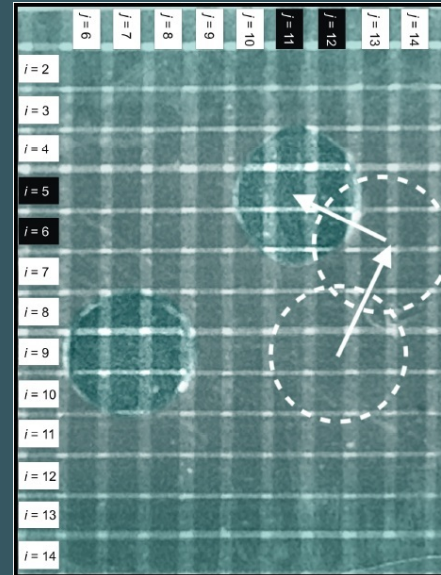
Research (optics and microsystem technologies)

- Biosensors
 - Optical biosensors
 - Lab-on-a-chip microsystems
- Biomedical spectroscopy
 - Terahertz spectroscopy devices
 - Applications to oncology and radiology



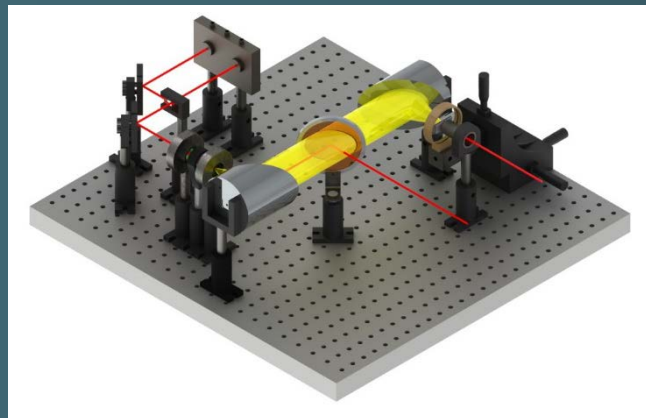
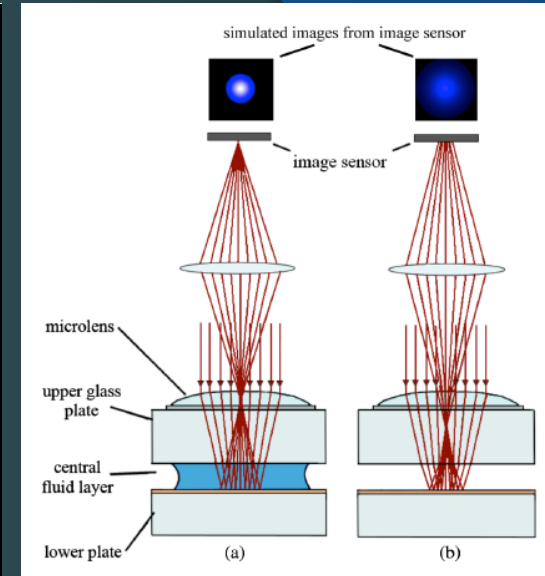
Optical biosensors

Jin, Hristovski, Collier et al., *Opt. Lett.*, 2015



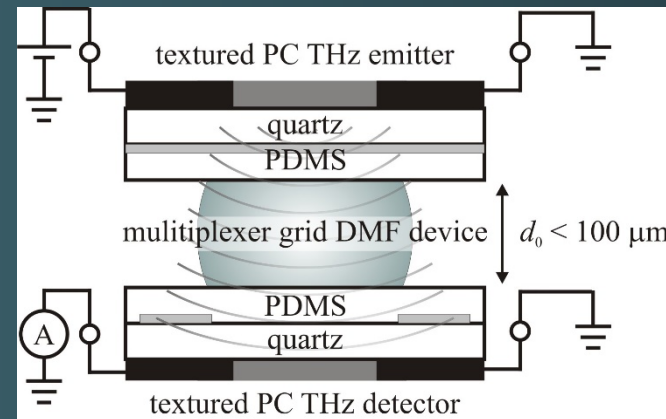
Lab-on-a-chip microsystems

Collier et al., *Micromachines*, 2011

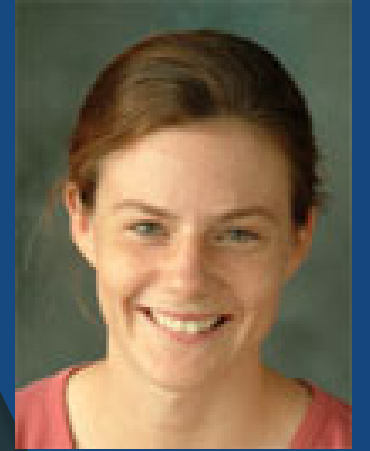


Terahertz spectroscopy devices

Collier et al., *Scientific Reports*, 2016

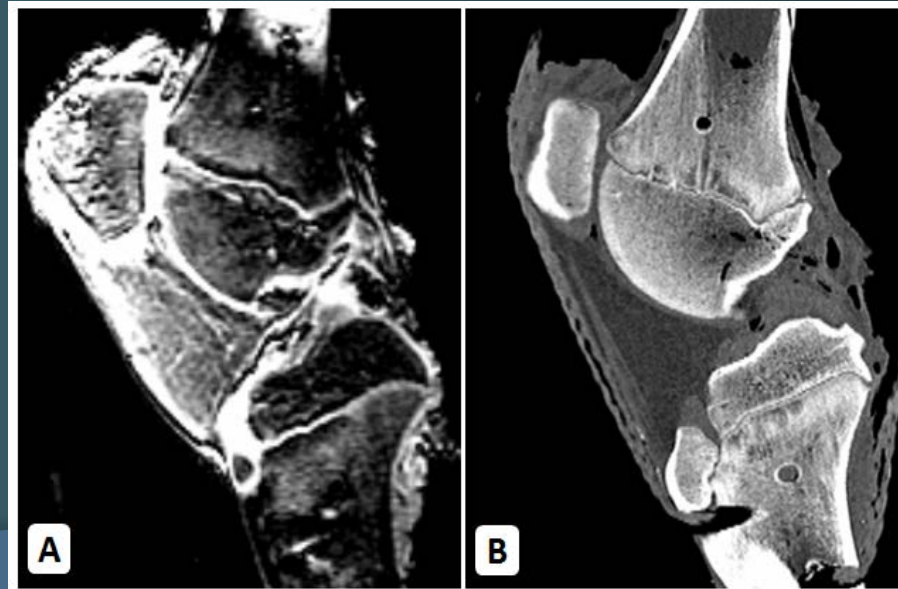
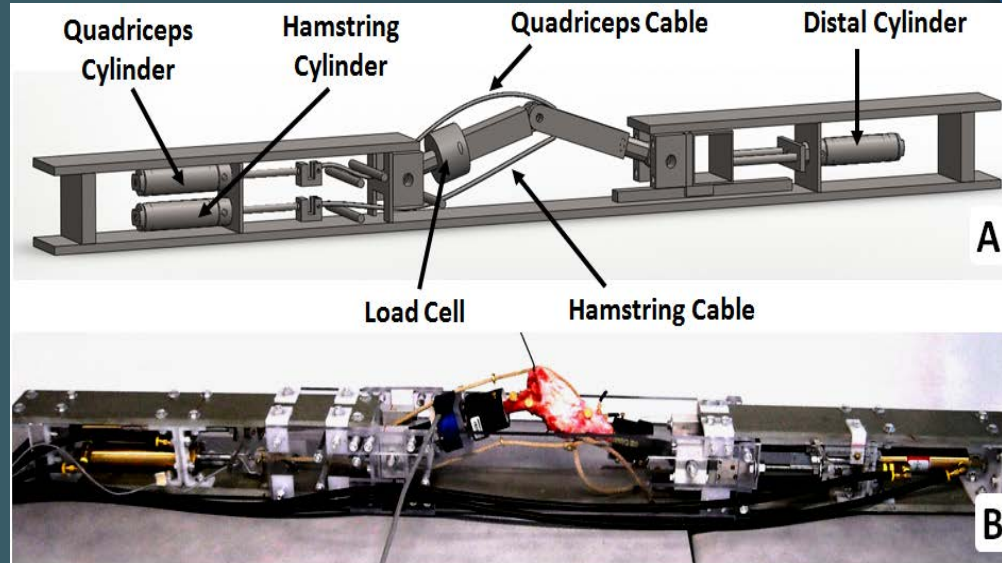
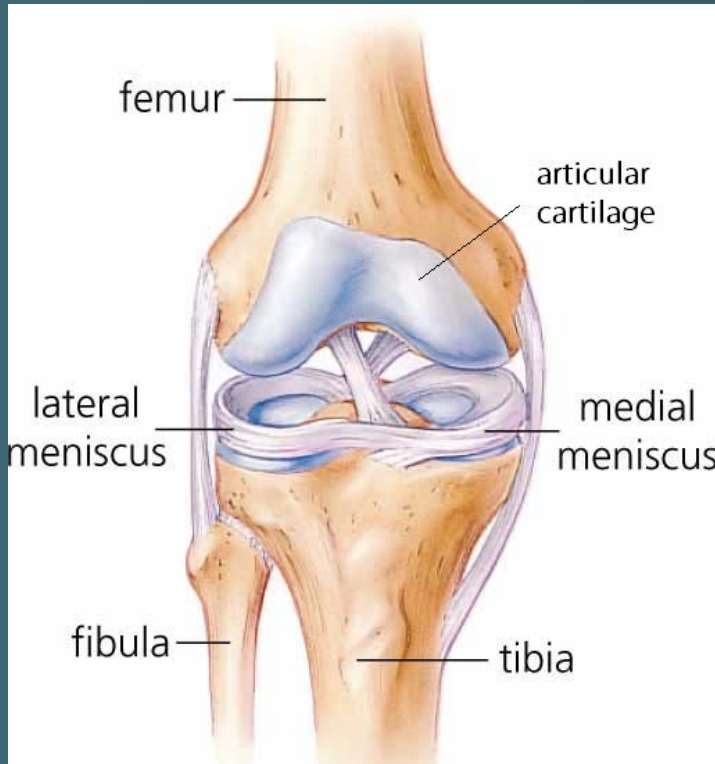


Professor Karen Gordon



- ◉ Associate Dean Undergraduate
- ◉ Teaching
 - ENGG*3170 Biomaterials
- ◉ Research
 - Joint Biomechanics
 - Osteoarthritis
 - Soft tissue mechanics related to the musculoskeletal system

Knee Meniscus Orthopaedics



Professor Michele Oliver

Teaching

- ENGG*2160 Mechanics II
- ENGG*3150 Engineering Biomechanics
- ENGG*6300 Research Methods in Bioengineering

Research

- Development, validation and use of novel wrist and knee wearable devices
- Whole-body vibration mitigation methods
- Driving simulation



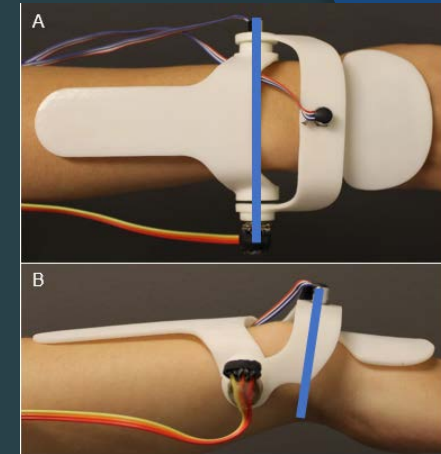
The central theme of my research program is the prevention of workplace injuries.



Whole-Body Vibration Reduction Strategies



DRiVE Lab 2.0 (Driving Research in Virtual Environments 2.0)



Wrist and Knee Wearable Development, Validation and Use

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Professor John Runciman

- ◉ Director
- ◉ Teaching
 - ENGG*2100 Engineering and Design II
- ◉ Research
 - Surgical and assistive device design
 - Bone and joint mechanics
 - Cardiovascular biomechanics
 - Sports biomechanics
 - FSAE race team advisor





Characteristic Shape	Mode Number	Frequency, Hz
	1	3.2
	2	3.9
	3	27
	4	36
	5	60
	6	90

Professor Ashutosh Singh

Teaching

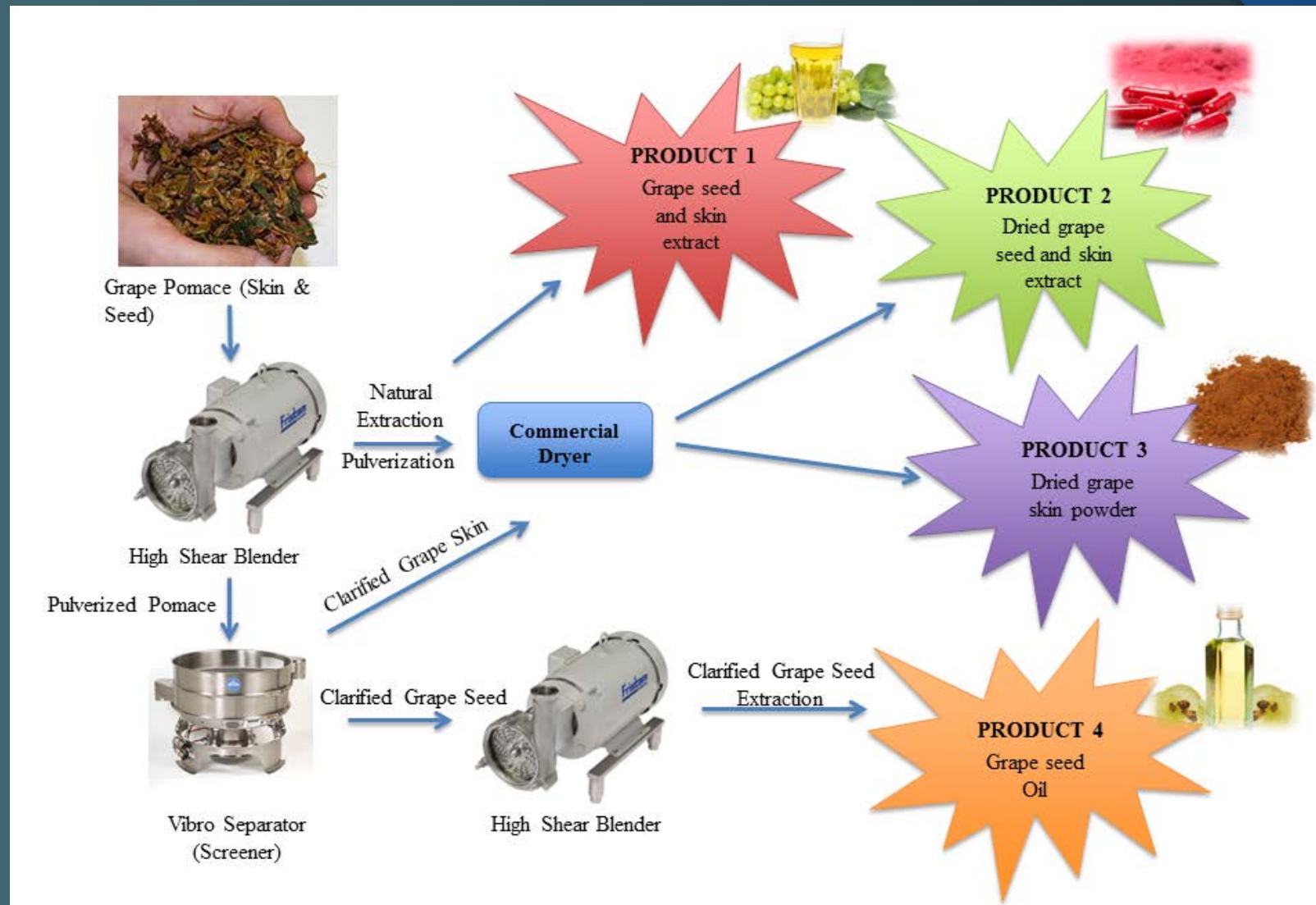
- ENGG* 3160 Biological Engineering Systems II
- ENGG*2660 Biological Engineering Systems I

Research

- Molecular dynamics of food components
- High electric field processing of thermo-sensitive food products
- Development of new food products and processes
- Development of Biosensors for food applications



Development of new food products and processes



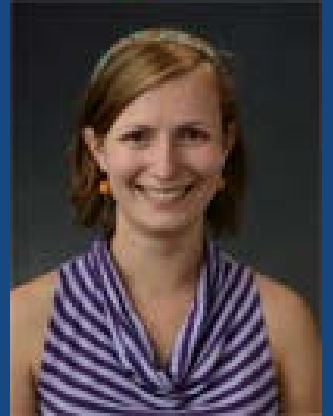
Ahmed Mezil

- Senior Biomedical Engineering Laboratory Coordinator
- Courses Supported
 - Signal Processing
 - Medical Imaging Modalities
 - Bioinstrumentation Design
 - Biomechanics



Jacqueline Fountain

- ◉ Biological Engineering Lab Technician
- ◉ Courses Supported
 - Biological Engineering Systems II,
 - Bioreactor Design,
 - Bio-Process Engineering,
 - Food Processing Engineering, and
 - Biomaterials



Welcome!

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