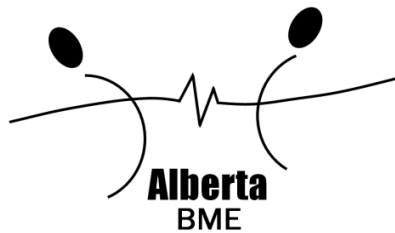


13th Annual Alberta Biomedical Engineering Conference Program and Proceedings



October 19th – 21st, 2012
The Banff Centre
Banff, Alberta



We gratefully acknowledge the support of our
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NSERC CREATE Training Program
for Biomedical Engineers for the
21st Century



13th Alberta Biomedical Engineering Conference Banff 2012



UNIVERSITY OF
CALGARY



October 19 – 21, 2012
The Banff Centre
Banff, AB

PROGRAM COMMITTEE

CONFERENCE ORGANIZERS

Co-Chairs	Nigel Shrive, University of Calgary Richard Frayne, University of Calgary Marwin El-Rich, University of Alberta Samer Adeeb, University of Alberta Jon Doan, University of Lethbridge
Student Co-Chairs	Swathi Damaraju, University of Calgary Emily Bishop, University of Calgary Michael DuVall, University of Calgary

ABSTRACT REVIEWERS

University of Calgary	Richard Frayne Nigel Shrive Mike Smith Neil Duncan Jane Desrochers Saleem Abubacker
University of Alberta	Marwan El-Rich Jason Carey Tarek El-Bialy Samer Adeeb
University of Lethbridge	Jon Doan Sorina Truica

POSTER JUDGES

University of Calgary	Mark Ungrin Colin Dalton Steve Boyd Tannin Schmidt Anders Nygren Roman Krawetz
University of Alberta	Marwan El-Rich
University of Saskatchewan	Daniel Chen

PODIUM JUDGES

University of Vermont, USA	Ian Stokes
University of Alberta	Arthur Prochazka
University of Calgary	Walter Herzog

STUDENT VOLUNTEERS

University of Calgary	Swathi Damaraju	Undergraduate Funding, review coordination, social event planning, great challenge, Co-chair for podium sessions
	Emily Bishop	Undergraduate Funding, review coordination, social event planning, great challenge, Co-chair for podium sessions
	Mike Duvall	Ordering registration gifts, review coordination, great challenge, Co-chair podium sessions
	Perla Cota	Fundraising, Co-chair podium sessions
	Ben Zhang	Fundraising
	Britta Jorgenson	Registration package assembly, Co-chair podium sessions
	Quinn Thomson	Co-chair podium sessions
	Saleem Abubacker	Abstract reviews, Co-Chair podium sessions
	Estee Lee	Registration package assembly, Co-chair podium sessions
	Atefeh Ghazavi	Friday night Podium powerpoint coordination
	Amanda Chan	Registration table
	Linda Tamez	Registration package assembly, registration table
	Jan Owoc	Photographer
	Madiha Khurshid	Registration package assembly
	Ryan Madden	Registration package assembly, registration table
	Scott Moorman	Registration package assembly
	Mohsen Shandiz	Friday night Podium powerpoint coordination
	Grant Cechmanek	Registration table
	Jaspreet Kaur	Registration table
University of Alberta	Kamrul Islam	Great challenge, Co-chair podium sessions
	Jonathon Schofield	Great challenge, Co-chair podium sessions
	Tanvir Mustafy	Great challenge, Co-chair podium sessions
	Hongru Zhao	Co-chair podium sessions

SUPERSTARS

University of Calgary	Lisa Mayer Mark Frayne Amanda Lottermoser
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A BIG THANK YOU TO ALL OF OUR VOLUNTEERS WHO HELPED WITH THE ORGANIZATION AND PLANNING OF OUR CONFERENCE THIS YEAR!!



PROGRAM

Podium Sessions are in the Max Bell Auditorium.

Poster Sessions are in the Max Bell 251 and Max Bell 253.

FRIDAY

- 4:30 - 8:30 pm **REGISTRATION and CHECK-IN – Professional Development Center (PDC)
Front Desk / Lounge**
- 7:30 pm **Opening Reception – Kinnear Centre KC 103/105**
- Welcome:** Dr. Nigel Shrive
 Kinnear Centre KC 103/105

SATURDAY

- 7:00 – 8:00 am **BREAKFAST – Vistas Dining Room**
- 8:00 – 8:05 am **Welcoming Remarks – Dr. Nigel Shrive & Dr. Richard Frayne**
- 8:05 – 8:45 am **Guest Speaker #1: Dr. Ian Stokes, University of Vermont, USA**

 “The Biomechanics of Spinal Stability – A Lifelong Challenge”

Session Chair: Perla Cota, U of C and Hongru Zhao, U of A
- 8:45 – 9:55 am **Student Podium Presentation Session #1**
- Session Chair:** Britta Jorgenson, U of C and Tanvir Mustafy, U of A
- | | | |
|------------------|----|--|
| Saleem Abubacker | 01 | Cartilage Boundary Lubricating Ability of PRG4 Monomers versus Multimers |
| Garrett Melenka | 02 | Experimental Analysis of Braided Tubular Composites for Catheter Design |
| Brayden Kooistra | 03 | Profiling changes in the metastatic potential of breast cancer cells exposed to flow |
| Jason Robertson | 04 | Development of grip and moment control during a grasp, lift, and hold task |
| Rafael Fortuna | 05 | Do Skeletal Muscle Properties Recover Following Botulinum Toxin Type-A Injections? |
| Leah Peterson | 06 | PRG4 and Hyaluronan Concentrations in Knee and Hip Synovial Fluid From Patients Undergoing Primary and Revision Arthroplasty Surgery |

9:55-11:10 am

Poster Session #1 (ODD NUMBERED POSTERS)**COFFEE/BEVERAGE BREAK****Max Bell 251(Fish Bowl) and Max Bell 253**

Judges: Drs. Mark Ungrin, Colin Dalton, Steve Boyd – University of Calgary and Dr. Marwin El-Rich – University of Alberta, and Dr. Daniel Chen - University of Saskatchewan

Anthony Killick	01	Ratio of Propulsive to Total Impulses as an Indicator of Poling Efficiency in Skate Cross-Country Skiing
Kelsey Collins	03	Does metabolically-induced obesity affect the severity of Knee Osteoarthritis?
Kamrul Islam	05	A Methodology for Designing Talar Prosthetics Based on Geometric Analysis
Elham Behradfar	07	Contribution of Purkinje-Mycardium Coupling to Shock-Induced Ventricular Fibrillation
Conrad Tang	09	A Prospective Study Evaluating the Effects of MRT on the Treatment of Patellofemoral Pain Syndrome
Chenglin Liu	11	Synchrotron based imaging and tomography of hydrogel scaffolds for tissue engineering
Chukwuemeka Nzekwu	13	Developing a Cranial Bone Model for Assessing Key Parameters for Intracalvarial Infusion
Alireza Sojoudi	15	Comparing Various Time-Frequency Analysis Techniques for Resting State fMRI
Atefeh Ghazavi	17	Effect of Electrode Geometry on Neuron Stimulation
Jon Jimenez	19	Function Near-Infrared Spectroscopy Reveals Differences in Hemodynamic Changes During Motor Function Tasks in Multiple Sclerosis Patients
Megan Hunt	21	Effect of Spatial Distribution of Human Embryonic Stem Cells on Mass Transfer in Static Culture
Jordan Woehr	23	Novel Exploitation of Compressed Sensing to Perform Extrapolation
Krysta Powers	25	The Contributions of Titin and Collagen to Passive Tension in Muscular Dystrophy with Myositis
William Enns-Bray	27	A Method for Mapping Trabecular Anisotropy of the Proximal Femur
Taryn Ludwig	29	Effect of Acute Flare Reaction to Intra-Articular Injection on Cartilage Lubricating Ability of Human Synovial Fluid
Luca Li	31	Quantitative Comparison of Susceptibility-weighted Magnetic Resonance Imaging Methods for Detection of Differences in Deep Grey Matter in Multiple Sclerosis
Ian Mahood	33	Development of Coplanar Capacitive Based Hydrogel pH Sensor
Christina Jablonski	35	Integrin $\alpha1\beta1$ is required for Chondrocyte Calcium response to Osmotic Stress
Jan Owoc	37	Noninvasive Assessment of Bone Strength using Micro Finite Element Analysis
Denver Surrao	39	Expansion of Skin-Derived Precursor Cells in A Suspension Bioreactor
Mohsen Akbari Shandiz	41	Kinematic Differences in Pre and Post Total Knee Arthroplasty
Marcela Rodriguez Ramirez	43	Detection of Keypoints for Image Registration in Cardiac Optical Mapping Studies
Samiul Choudhury	45	Preliminary ROC Results for Optic Neuritis Transfer Function Characterization

11:10 – 12:30 pm

Student Podium Presentation Session #2**Session Chair:** Emily Bishop, U of C and Kamrul Islam, U of A

- | | | |
|----------------------|----|--|
| Jonathon Schofield | 07 | An Assistive Knee-Ankle-Foot-Orthosis and Sit-to-Stand Biomechanics |
| Quinn Thomson | 08 | Interobserver Variation of Ischemic Tissue Classification in Early CT Images |
| Bernd Friesenbichler | 09 | Whole-Body-Vibration Training Intensity Assessed by Near-Infrared-Spectroscopy |
| Estee Lee | 10 | Optimal Repetition Time Ranges for Dynamic Contrast Enhanced T1-weighted Magnetic Resonance Imaging |
| Swathi Damaraju | 11 | Effect of mechanical stimulation on mineralization capability of osteoblasts in a type-I collagen scaffold |
| Perla Cota | 12 | Turning Skin into Cartilage: A transdifferentiation strategy for cartilage regeneration |
| Miles Hunter | 13 | Effects of Concentration on Synergistic PRG4-Hyaluronan Cartilage Boundary Lubrication |

12:30 – 1:45 pm

LUNCH – Vistas Dining Room

1:45 – 2:30 pm

Industry Panel Speakers:**Marc Lebel**, General Electric Healthcare**Eric Renteria**, Materialise USA, Mimics Innovation Suite**Matt Beer**, Smith and Nephew, Patient Positioning (formerly Tenet)**Session Chair:** Mike DuVall, U of C and Honru Zhao, U of A

2:30 – 2:35 pm

BREAK – Group Pictures

2:35-3:50 pm

Poster Session #2 (EVEN NUMBERED POSTERS)**COFFEE/BEVERAGE BREAK****Max Bell 251 (Fish Bowl) and Max Bell 253****Judges:** Drs. Mark Ungrin, Colin Dalton, Tannin Schmidt, Anders Nygren, Roman Krawetz – University of Calgary and Dr. Daniel Chen - University of Saskatchewan

- | | | |
|-----------------------|----|---|
| Andrew Sawatsky | 02 | The Effect of Knee Extension Force on Patellofemoral Tracking |
| Quinn Boser | 04 | Test System for Mechanical Testing of Pelvic Fracture Fixation |
| Jaspreet Kaur | 06 | Importance of Fitting Membrane Resistance in Single Cell Models |
| Jennifer Baltich | 08 | Identification of Basic Muscle Activation Patterns during Cycling using Variability |
| Lisa Graham | 10 | Perceived Advantages of Employing Gamification Strategies in Health Programs |
| Ben Zhang | 12 | Purification of mESC Bioreactor Differentiated Chondrocytes using Reovirus |
| Huishu Hou | 14 | Animal Models Design for the Research of Using Alginate Scaffolds Repair for Spinal Cord Injury |
| Runze Yang | 16 | Identifying acute ischemic stroke using frequency domain near-infrared spectroscopy |
| Mojtaba Kazemi Miraki | 18 | Viscoelastic Response of the Knee Joint in Large Deformations- A Fibril-Reinforced Poromechanical Study |
| Fatemeh Moghaddam | 20 | Finite Element Analysis of Traumatic Brain Injury Considering Cell-ECM Interaction |

Terri Semler	22	Feasibility of Genipin-Crosslinked Fibrin Gels as a Patch for Annulus Fibrosus Repair
Ryan Madden	24	Effect of Loading Magnitude on Calcium Signaling in Articular Cartilage Chondrocytes
Joyce Mak	26	Development of an MRI-based method for labeling endogenous cells in a mouse knee joint
Ken Fuh	28	Demonstrating effectiveness of a new hydrostatic compliance measuring device using collagen gels
Zohreh Salimi	30	Ergometer Model for Representing Straight-Line Floor Wheelchair Propulsion
Britta Jorgenson	32	Distinguishing the difference between the effects of cortical porosity and tissue mineralization on apparent cortical density for the prediction of bone strength.
Grismika Gupta	34	Prototype of a low cost, sensing device to assist in the physiotherapy and day-to-day treatment of incorrect posture due to the tightening of pectoral muscles and hip-flexors or Kyphosis and Scoliosis
Kaveh Saffar	36	Three-Phase Model for Crack Behavior in Functionalized Carbon Nanotube Reinforced Bone
Sean Crook	38	Oxygen uptake in One and Two Skate Cross Country Skiing At Increasing Grades
Ryan Lewinson	40	Pain reduction in runners with PFPS is predicted by absolute change in knee angular impulse
Amin Gazanfari	42	Effect of Cardiac Fiber Rotation on Epicardial Surface Measurements
Tanvir Mustafy	44	FINITE ELEMENT STUDY OF THE CERVICAL SPINE RESPONSE UNDER SAGITTAL MOMENTS
David Adair	46	An image processing application for use in clinical trials for atherosclerosis disease

3:50 – 5:10 pm

Student Podium Presentation Session #3**Session Chair:** Swathi Damaraju, U of C and Jon Schofield, U of A

Emily Bishop	14	Changes in the finite helical axis over time in two ACL deficient individuals
Lindsay Burrowes	15	Application of Reservoir-Wave Theory to Coronary Circulation; Effect of Vasoconstriction
Christopher Sarsons	16	Gadolinium Functionalized Dendrimer Nanoparticles as a Targeted Contrast Agent for the Detection of Atherosclerotic Plaques via Magnetic Resonance Imaging
Alexandra Pulwiski	17	Evaluation of MR Image Normalization Methods for Cerebral Small Vessel Disease
Emily Marasco	18	Solving Health Issues Associated with Urban Low Frequency Noise Irritants
Michael Samsom	19	Effect of Hyperosmolarity on PRG4 and HA's Ocular Surface Boundary Lubricating Ability at a Human Cornea-Eyelid Biointerface
Scott Stanger	20	Bone Structure and Strength in Competitive Gymnasts

6:00 – 7:00 pm

DINNER – Vistas Dining Room

7:00 pm

“THE GREAT CHALLENGE” Max Bell Fish Bowl

8:00 pm

Social – Elk and Oarsman

119 Banff Avenue (2nd Floor, Above The Ski Hub)

SUNDAY

7:15 – 8:15 am

BREAKFAST – Vistas Dining Room

8:15 – 8:45 am

Checkout

8:45 – 9:25 am

Guest Speaker #2: – Dr. Art Prochazka, University of Alberta

“Neuroprostheses and tele-supervised exercise to improve hand function after stroke and spinal cord injury: benefits and limitations”

Session Chair: Quinn Thompson, U of C and Jon Schofield, U of A

9:25 – 10:20 am

Student Podium Presentation Session #4

Session Chair: Saleem Abubacker, U of C and Tanvir Mustafy, U of A

Steven Burgoyne	21	Aortic Wave Reflections with Artificial Carotid Baroreflex Activation
Katherine Evan	22	An Objective Measurement of Hip Protector Compliance
Jochen Fahr	23	Tools for a more (cost) efficient cell culture
Mohammad Atarod	24	Ligament Interactions During Normal Gait in the Ovine Stifle Joint
Sam Dorosz	25	Cartilage Boundary Lubricating Ability of Full-Length Human Recombinant PRG4 – Alone and in Combination with Hyaluronan

10:20-10:40 am

Poster Session #3 (FINALISTS ONLY)**COFFEE/BEVERAGE BREAK****Max Bell 251 (Fish Bowl) and Max Bell 253**

Judges: Drs. Mark Ungrin, Colin Dalton, Tannin Schmidt – University of Calgary and Dr. Marwan El-Rich – University of Alberta, and Dr. Daniel Chen - University of Saskatchewan

10:40 – 11:35 am

Student Podium Presentation Session #5

Session Chair: Estee Lee, U of C and Kamrul Islam, U of A

Eng Kuan Moo	26	Chondrocyte Membrane Mechanics at Different Loading Rates
Hongru Zhao	27	Can the Fibular Allograft be used to Replace the Coronoid Process? Coronoid Process Articular Geometry Investigation
Amanda Chan	28	PRG4 Reduces Friction at a Human Cornea-Contact Lens Biointerface
Vivian Wang	29	Effect of Intermittent Passive Stretching on Serial Sarcomere Loss Caused by Electrical Stimulation in Rabbit <i>Triceps Surae</i> Muscles
Saghar Nasr	30	The Effect of Stem Cell Diffusion Rate on Fracture Healing in a Murine Tibia

11:45 – 12:30 pm

Final Award Presentations

Podium and Poster Prize Presentations – Sponsored by the NSERC CREATE Training Program for Biomedical Engineers for the 21st Century

NSERC CREATE Prize presentations for Most Outstanding Student Posters

- a) Best Overall Poster, b) Most Creative Poster, c) Clearest Message Poster

NSERC CREATE Prize presentations for Most Outstanding Podium Presentations

- 1st First Prize, 2nd Second Prize, 3rd Third Prize

Canadian Society of Biomechanics/Société canadienne de biomécanique

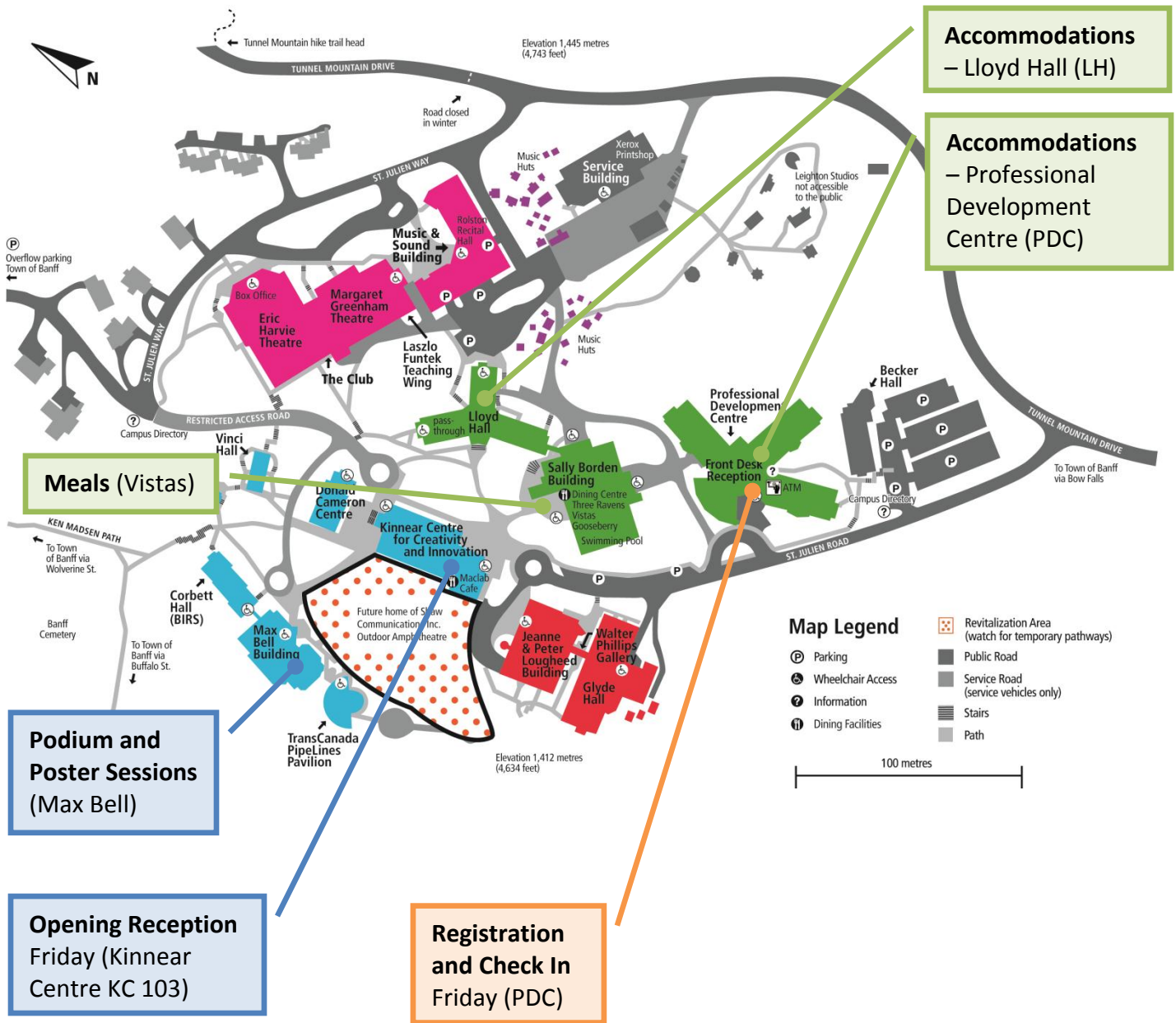
- a) Podium Presentation Prize
- b) Poster Presentation Prize

CLOSING REMARKS

Emily Bishop, Mike Duvall, and Swathi Damaraju

AB BME Conference / Student Directors, University of Calgary

Map and Meeting Location



Directions to Elk and Oarsmen (Saturday Social)

119 Banff Avenue (2nd Floor, Above The Ski Hub)



Guest Speaker #1 – Dr. Ian Stokes**Professor, Department of Orthopaedics & Rehabilitation
University of Vermont, USA****“The Biomechanics of Spinal Stability – A lifelong challenge”**Abstract

Stability means that a system returns close to its initial state after a perturbation. The spine is continuously responding to perturbations. In infants, the ability to sit is an early developmental 'landmark' requiring that the infant controls the trunk as an inherently unstable inverted pendulum. Throughout life, we have to balance muscle forces to avoid spinal buckling (the spine is like a chain of inverted pendulums). These inverted pendulums are evidently stabilized because of the stiffness of activated muscle, which can be augmented by activating antagonistic muscles. During rapid skeletal growth the spine has to grow symmetrically to avoid developing a lateral curvature, despite the fact that bone growth is sensitive to applied forces. So, spinal biomechanics has progressed far beyond early static analyses of spinal 'overload'. Because it is impossible to make experimental studies of an unstable human spine, analytical methods have been valuable to identify the stabilizing role of muscles and muscle stiffness, as well as the enigmatic role of abdominal musculature and intra-abdominal pressure, leading to recommendations for muscle training therapies. During adolescent growth, it appears that once a deformity reaches a critical magnitude, a vicious cycle develops in which asymmetrical spinal loading results from spinal lateral curvature and causes asymmetrical growth and vertebral and discal wedging, producing more lateral curvature, etc. Spinal Biomechanics is not unexplored scientific territory, but is still a very fertile and clinically important area for biomechanical research.

Bio – Ian Stokes, PhD

After graduating in Engineering Science from Cambridge University in 1971, Ian Stokes found his way to a position as Research Assistant at the Polytechnic of Central London with Billy Hutton as his brilliant advisor, working on the biomechanics of the forefoot as it relates to diabetic neuropathy and hallux valgus. Then, after a 'Grand Tour' of North American biomechanics labs by Greyhound bus, he obtained a post-doctoral position at the Nuffield Orthopaedic Center, Oxford, working with biplanar x-ray and stereo-photogrammetric methods to document spinal motion and back shape. Then, a 3-year 'research-track' position at the University of Vermont (Orthopaedics and Rehabilitation) actually lasted over thirty years. Tackling the question "If spinal biomechanics is the answer, then what is the question?" led him to identify research areas that seemed to offer opportunities to make useful contributions. The first was to determine functional roles of muscle activation around the lumbar spine. The second area concerns how the biomechanics of the spine is altered by the presence of a scoliosis deformity, and how this can contribute to progressive deformity during skeletal growth. Ian Stokes is also an active participant in the Richmond (Vermont) Trails Committee, the London Douglas Motor Cycle Club, Students for Justice in Palestine, Citroën Rendezvous, and Bike Recycle Vermont.



Guest Speaker #2 – Dr. Arthur Prochazka, University of Alberta**Professor, Centre for Neuroscience, University of Alberta****“Neuroprostheses and tele-supervised exercise to improve hand function after stroke and spinal cord injury: benefits and limitations”**Abstract

Although electrical stimulation is widely used to strengthen muscles, only a small minority of people with stroke or spinal cord injury use neuroprostheses to augment hand function in activities of daily life. Surface stimulators can augment hand grasp and release and this can sometimes make an important difference to independence. Implanted neuroprostheses can target more muscles. I will discuss three neuroprosthetic approaches, the Freehand system, the Stimrouter system and intraspinal microstimulation. I will also compare voluntary control systems such as brain machine interfaces, the head-mouse and wireless earpieces that respond to toothclicks.

Exercise plays an important role in maximizing residual function. Devices have recently emerged that encourage exercise in a structured and entertaining way. Cost is an important factor. I will compare robotic and passive exercise devices, with a focus on in-home tele-supervised exercise with the Rehabilitation Joystick for Computerized Exercise (ReJoyce).

Supported by Alberta Innovates Health Solutions, the Canadian Institutes of Health Research and the Rick Hansen Institute

Bio – Arthur Prochazka

Dr. Arthur Prochazka is a professor in the Centre for Neuroscience, University of Alberta. His basic research concerns the neuromechanics of voluntary movement. Clinical projects focus on improving hand function after stroke and spinal cord injury, with the use of neuroprostheses and the “ReJoyce” system (Rehabilitation Joystick for Computerized Exercise). Recently the system was used in the first randomized controlled study of Internet-mediated tele-rehabilitation. Follow-on trials are now underway in several cities in Canada, the US and Australia. Other projects include the use of intraspinal and peripheral nerve stimulation for bladder control and the reduction of spastic hypertonus.



Industry Panel

Marc Lebel, PhD, General Electric Healthcare

Dr. Lebel is a Calgary-based Scientist in General Electric's Applied Science Laboratory, a global team advancing MRI acquisition and processing methods. Dr. Lebel holds a BSc in Physics from the University of Calgary, an MSc in Medical Biophysics from the University of Western Ontario, and a PhD in Biomedical Engineering from the University of Alberta. This is his fourth Alberta Biomedical Engineering Conference but the first time he's not being judged.



GE Healthcare

GE Healthcare is a major business unit of General Electric with over 53000 employees globally and an R&D investment exceeding \$1 billion/year. Over 3000 scientists and technologists are sited in five major research facilities and several hundred scientists are scattered in academic institutions. GE Healthcare operates under the mantra of “healthymagination” – a commitment to help people live healthier lives by lowering costs, improving quality, and increasing access. With the installation of two research-dedicated MRI scanners, the University of Calgary and GE Healthcare have recently strengthened a partnership devoted to improving patient care with a focus on improved pediatric and neurovascular imaging.

Industry Panel

Eric Renteria, Accounts Manager, Materialise

Eric Renteria is an Account Manager at Materialise on the Biomedical Engineering team. He has worked at Materialise for 4 years. He received his bachelor's degree for Biomedical Engineering from Texas A&M University.



Materialise

Innovations that make a difference; that is the core of what we aim to achieve at Materialise.

Our commitment to innovation and high-quality support, combined with the needs and desires of our customers, can lead to lives being touched in ways we never could have anticipated. By empowering our customers to add a real personal touch in what they do, we are changing lives...

We assist *doctors* in treating their patients with tailor-made solutions, leading to a lower risk of complications and much greater results. We give *designers and engineers* the ability to bring unique innovations to life that push the limits of modern technology; to bring products to the market that better respond to the needs of the *consumer*; and to take advantage of mass customization instead of mass production. Finally, we give individuals the chance to contribute to the design process, whether by giving them tools to personalize a design or by helping bring their own creations to life. With our assistance, anyone and any company – whether large or small – can create world class products or offer excellent service. When people have passion, we are there to help them materialise their dreams.

Materialise has a large team devoted to Research and Development and it is their goal to bring about advances that matter; advances that lead to e.g. lighter weight designs, higher quality materials, and new possibilities for personalization. Advances that allow others to truly add to a personal touch in that they do. To aid us in achieving this goal, our global research resources allow us to quickly investigate and integrate new areas of expertise. Materialise has collaborative relationships in many countries, including long-standing partnerships with universities, research institutes, and suppliers.

Additionally, Materialise stimulates top level research through the Mimics Innovation Awards. We are convinced that many interesting biomedical research projects never get further than a planning stage, due to a lack of money. We, at Materialise, want to support these researchers in making the world a bit healthier.

Industry Panel

Matt Beer, P.Eng, Smith and Nephew, Patient Positioning

Born and raised in Calgary, Matt earned his Bachelor of Science in Manufacturing Engineering with a minor in Mechanical Engineering from the University of Calgary. Through his internship at Nortel Networks in a manufacturing role as well as a design engineering position at Beta Machinery Analysis, Matt developed a passion in the design and manufacturing industry resulting in his current role as the Engineering Manager of Smith and Nephew's Patient Positioning Franchise. In this role, Matt is responsible for overseeing the completion of new R&D projects as well as the upkeep on existing products for the medical patient positioning industry.



Matt and his wife Angela have 2 sons and live in Chestermere, Alberta. His hobbies include enduro motorcycling, woodworking, and soccer.

Smith and Nephew – Patient Positioning

In 2011, Smith and Nephew acquired TENET Medical Engineering to create Smith and Nephew's Patient Positioning Franchise. Smith and Nephew is a global medical devices company that focuses on repairing and healing the human body. It was formed in 1896 and today operates in 90 countries with global sales of nearly \$4.3 billion, and employs over 11,000 people. The Patient Positioning Franchise designs and manufactures patient positioning devices for surgical procedures of the human joints.

The Vice President (Research), University of Calgary, Gold Sponsor

Within the *Strategic Research Plan* of the University of Calgary, there are six themes that meet the criteria established for defining a research priority: matching the University's strengths with opportunities, increasing the University's research capacity, and creating a dynamic research environment to promote research excellence. One of the themes is "***Engineering Solutions for Health: Biomedical Engineering.***"

The University recognizes that healthcare is one of the most significant annual expenditures for governments worldwide. Healthcare spending is the largest single item in the Alberta government budget, representing 40 percent of the total budget of approximately \$37 billion. There is an urgent need to manage this spending more effectively and to obtain the maximum benefit for Albertans. In the US, a three-year study* was undertaken recently to understand engineering tools or technologies that could improve the health care delivery system. The findings show that "a vigorous partnership among the engineering, management and health fields will be required to accelerate the move to a systems approach to quality improvement in health care." It found that "systems engineering ... offers a large portfolio of tools that could potentially transform the quality and productivity of health care." The key recommendations focus on the establishment of multiple (30-50) multidisciplinary centres for studying health systems engineering at universities and colleges. In addition it recommends that through these centres, both formal and continuing education programs should teach healthcare, engineering and management professionals the value of an engineering systems approach to healthcare solutions.

Biomedical engineering is the application of such engineering approaches to solving problems in healthcare, and it is one of the fastest growing disciplines of engineering. The development and sales of medical devices and technologies for health constitute a US\$140-180B industry that is growing at over 10% annually. In the United States, the number of biomedical engineering jobs is expected to grow twice as fast as the average rate of job growth for all industries. In Alberta, half of the 130 bioindustry companies expect significant growth in the next few years. An additional 1500 new positions are expected to be added to the 4,500 workers already directly employed. More importantly, 37 percent of the current employees have an MSc or PhD degree, highlighting the need for advanced education in this field. Historically, Canada has imported more medical technology than it has exported (\$3.8 billion in imports, compared to \$2.1 billion in exports in 2003, for example). To sustain its economy and to be competitive in the global market, Canada needs to ensure that it fosters its innovation and commercialization potential to the fullest.

As a prominent research institution, the University of Calgary's Biomedical Engineering program trains leading-edge researchers in its state-of-the-art facilities with the intention of meeting the challenge of educating biomedical engineers for the future suggested in the US report. Within the University, biomedical engineering has a long history and is rooted in interdisciplinary work across faculties. To tie healthcare, engineering and management together more explicitly, the University hosts an NSERC CREATE initiative called 21st Century Biomedical Engineers, a unique training program giving graduate students the opportunity to gain advanced skills for careers in industry, government or academia. As a result of this focus and investment, the University

of Calgary biomedical engineering group ranks the best in Western Canada based on research publications and impact.

To complete the research development pipeline, the University has several initiatives focusing on commercialization activities, including the Biovantage Alberta Ingenuity Centre, BOSE Biomaterials and Tissue Engineering Development Centre, the Hotchkiss Brain Institute's partnership with Integra Life Sciences Corporation, Ward of the 21st Century, and Clinexus (funded by Enterprise and Advanced Education to accelerate existing small/medium enterprises in health technology areas). These centres focus on developing technologies and better treatment methods in many areas such as stroke, Alzheimer's, arthritis, bone and joint conditions, heart disease, and neurological injury.

The Biomedical Engineering Graduate Program at the University of Calgary thus offers a powerful combination of options. It is a joint program offered through the Schulich School of Engineering and the Faculties of Medicine and Kinesiology in conjunction with the University of Alberta. Students can take courses from either institution towards their MSc, PhD or MEng degrees. Over 60 faculty members from across the University of Calgary are involved in multidisciplinary biomedical engineering. High calibre research program and teams are led by an exceptional community, recognized by national and provincial funding agencies with over 40 award winning chairs, professorships and scholars, as well as industry chairs and graduate students scholarships. The Biomedical Engineering program is one of our six research themes at the University of Calgary and is aligned with Alberta provincial strategic directions. Research is generally focused on three key technology platforms and applications areas.

Technology platforms: Diagnostics and therapeutics, Imaging and instrumentation, Biosensors

Application areas: Orthopaedics, Cardiovascular systems, Neurology

The office of the Vice-President (Research) is very pleased to sponsor the Annual Alberta Biomedical Engineering Conference, bringing together students and staff from across the Province. Students are heavily involved in organizing and running the conference. This involvement benefits the students by giving them the opportunity to present their work and learn of the breadth and depth of biomedical engineering research across the province. This conference will not only promote collaborations and partnership between the future generation of Alberta researchers and innovators but will also provide trainees with the opportunity to acquire industry know-how which will foster a bench to bed to market provision in their career development.

* "Building a better delivery system: A new Engineering/Health Care Partnership"

Proctor P. Reid, W. Dale Compton, Jerome H. Grossman, and Gary Fanjiang, *Editors*, Committee on Engineering and the Health Care System, Institute of Medicine and National Academy of Engineering, 2005

NOTES:

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