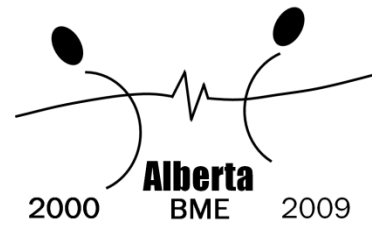


# 10<sup>th</sup> Annual Alberta Biomedical Engineering Conference Program



**October 23<sup>rd</sup> -25<sup>th</sup>, 2009**  
**The Banff Centre**  
**Banff, Alberta**







We gratefully acknowledge the support of our sponsors  
for making this conference a success



NSERC CREATE Training Program  
for Biomedical Engineers for the  
21st Century





# 10<sup>th</sup> Alberta Biomedical Engineering Conference - Banff 2009



UNIVERSITY OF  
ALBERTA



UNIVERSITY OF  
CALGARY



October 23 – 25, 2009  
The Banff Centre  
Banff, AB

## PROGRAMME

**Podium Sessions are in the Max Bell Auditorium.**

**Poster Sessions are in the Max Bell Lounge ("Fishbowl") and Max Bell 253.**

### FRIDAY

4:00 - 8:30 pm

**REGISTRATION and CHECK-IN – Professional Development Center Front Desk / Lounge**

7:30 pm

**Opening Reception – Donald Cameron Hall Dining Room**

**Welcome:** Dr. Michael Kallos & Dr. Alan Wilman  
Donald Cameron Hall Dining Room

### SATURDAY

7:00 – 8:00 am

**BREAKFAST – Vistas Dining Room**

8:00 – 8:05 am

**Welcoming Remarks – Dr. Michael S. Kallos & Dr. Alan Wilman**

8:05 – 8:45 am

**Guest Speaker #1: Dr. Nigel G. Shrive, University of Calgary**

**"Alternative Views"**

**Session Chair:** Dr. Robert Burrell, University of Alberta

8:45 – 9:55 am

**Student Podium Presentation Session #1****Session Chair:** Dr. Walter Herzog, University of Calgary

- |                      |    |  |
|----------------------|----|--|
| Kyle Nishiyama       | 01 | The Influence of Cortical Porosity on Bone Strength Measured <i>in vivo</i> by HR-pQCT                               |
| Breanne Landry       | 02 | Novel Cationic Polymer siRNA Delivery System For Treatment of AML  |
| Rafael Fortuna       | 03 | Morphological changes in contractile properties of muscles subjected to repeat injections of botulinum toxin (Botox) |
| Krishna Panchalingam | 04 | Bioengineering of Human Bone Marrow-Derived Mesenchymal Stem Cells in Suspension Bioreactors                         |
| Erica Westwood       | 05 | Using Near-Infrared Spectroscopy to Predict the Onset of Seizures  |
| Kevin Unrau          | 06 | Bone Formation with BMP-2 Nanofiber in Platelet-Enriched Biomaterial Scaffolds                                       |

9:55-11:10 am

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

**Judges:** Drs. Jeff Dunn, Salvatore Federico – University of Calgary and Drs. Larry Unsworth, Vivian Mushahwar – University of Alberta, and Dr. Albert Cross - University of Lethbridge

- |                       |    |   |
|-----------------------|----|---|
| Karelia Tecante       | 01 | Gender differences in the effectiveness of therapeutic footwear   |
| Jan Pajerski          | 03 | Non- Linear Model of Chondrocyte Compression in Articular Cartilage   |
| Amit Deshwar          | 05 | Empirical Testing of a Human Object Recognition Model   |
| Vishal Varshney       | 07 | Applying Coherence Analysis To Diffuse Optical Tomography Studies Using Near Infrared Light In Healthy Adults                 |
| Chris Bouwmeester     | 09 | Applying a Novel Reservoir-Wave Model to Describe Pulmonary Artery Wave Patterns  |
| Lisa Lovse            | 11 | Improving Gait after Spinal Cord Injury using Functional Electrical Stimulation and Feedback Control Strategies               |
| Jason Motkoski        | 13 | Lasers on Robots  |
| Brandon Hisey         | 15 | Thermal Dependence of Isometric Force and Stiffness in Single Fibres of the Frog <i>Rana pipiens</i>                          |
| Kitty Choy            | 17 | Development of a 6-degree of freedom testing system for spinal repair   |
| Caitlin Logan         | 19 | Investigating Wolff's Law: Trabecular Response to Chronic Abnormal Strain   |
| Allison Van Winkle    | 21 | Scaled-Down Expansion of Murine Embryonic Stem Cells in Bioreactors   |
| Charlotte Curtis      | 23 | Automatic detection of skin outline and anatomical landmarks on breast MR images  |
| Patrick Boyle         | 25 | The Purkinje system facilitates the development of disorderly cardiac arrhythmias   |
| Cheng Lu              | 27 | Improved Registration Technique for Dynamic Contrast Enhanced MRI Analysis Using Symmetric Gradient and Curvature Information |
| Einat (Natalie) Ravid | 29 | Controlled Nerve Lesioning With Direct Current  |
| Parisa Rahnema        | 31 | Effect of oxidative stress in cardiac impulse propagation   |

- |                |    |   |
|----------------|----|---|
| Michael DuVall | 33 | Calcium Interaction With Titin Immunoglobulin Domain In Cardiac Muscle    |
| Brodi Roberts  | 35 | An Automated System to Measure the Noise Figure of MRI Coil Preamplifiers |

11:10 – 12:30 pm

**Student Podium Presentation Session #2****Session Chair:** Dr. Greg Kawchuk, University of Alberta

- |                  |    |   |
|------------------|----|---|
| Mike Roberts     | 07 | Level Set Segmentation of Large Medical Data Sets on Modern Graphics Hardware                                   |
| Yuchin Wu        | 08 | Compositional and Material Properties of Rat Bone after Drug Treatment  |
| Matthew Walker   | 09 | Closed-Cycle Helium System for a Facility with 3 MRI Magnets and Feasibility of Cost Effective Initial Cooldown |
| Megan Hunt       | 10 | Medium Replenishment Strategies for the Culture of Human Embryonic Stem Cells                                   |
| Michele Vaillant | 11 | The Effect of the Displacement and Duration of Spinal Manipulations on Spinal Stiffness: Preliminary Results    |
| Cecilia Alvarez  | 12 | Synthesis of Proteoglycan 4 (PRG4) Disulfide-Bonded Multimers by Chondrocytes in Cartilage Explants             |
| Sana Vahidy      | 13 | Age-related changes in the frontal white matter measured by diffusion tensor imaging                            |

12:30 – 1:45 pm

**LUNCH – Vistas Dining Room**

1:45 – 2:30 pm

**Industry Panel:**

**Jaret Hargreaves**, Product Manager, Calgary Scientific  
**Brent King**, Vice President of Operations, TENET Medical Engineering  
**Arunas Salkauskas**, Senior Scientist, Imaging Dynamics Company

**Session Chair:** Dr. Arin Sen, University of Calgary

2:30 – 2:35 pm

**BREAK – Group Pictures**

2:35-3:50 pm

**Poster Session #2 (EVEN NUMBERED POSTERS)****COFFEE/BEVERAGE BREAK****Max Bell Fish Bowl and Max Bell 253**

**Judges:** Drs. Jeff Dunn, Salvatore Federico – University of Calgary and Drs. Larry Unsworth, Vivian Mushahwar – University of Alberta, and Dr. Albert Cross - University of Lethbridge

- |                 |    |   |
|-----------------|----|---|
| Ning Zhu        | 02 | Poly (l-Lactic acid) Scaffolds Embedded with Chitosan Microspheres for Nerve Regeneration       |
| Mathew Reynolds | 04 | Growth trends of a Mandible using CT Data   |
| Chiara Bellini  | 06 | In Vivo Dynamic Models of the Porcine Left Atrium: Effect of Pressure Overload on Wall Stresses |

Neel Kaipatur	08	Numerical Evaluation of Stress Profile of Mini-Implant and Rat Bone: A FEM Study
Haeyeon Lee	10	Biomaterials for Annulus Fibrosus Sealing
Brad Holinski	12	Restoring Stepping after Spinal Cord Injury using Novel Electrical Stimulation and Feedback Control Strategies
Robert Kirdeikis	14	A Wireless Continuous Compartment Pressure Monitoring System
Michael Dawson	16	Development of a Myoelectric Training Tool for Above Elbow Amputees
Laura Elena Alvarado Pacheco	18	Electrical Stimulation-assisted arm and leg cycling for improving ambulation after incomplete spinal cord injury
Yushan Huang	20	Magnetic resonance imaging study of cerebral gray matter, white matter, and cerebrospinal fluid in patients with major depressive disorder.
Xiaoyu Tian	22	Investigation into the Influence of Temperature on the Shear-Induced Cell Damage
Michael Zahorodny-Burke	24	An Investigation of Oxygen Transport in Microfluidic Cell Culture Devices
Katharina Schnackenburg	26	Bone Micro-architectural Parameters and Muscle Strength in Recreational Runners with and without Tibial Stress Fractures
Yves Pauchard	28	Effects of rigid body transformations on morphological analysis of 3D bone images
Harsh Singh	30	Tryptic degradation of coated BSA NPs for drug delivery based upon a fluorescence test
Kristen Ness	32	Using Ultrasound to Image Spinal Deformity
Dan Romanyk	34	Criteria and Considerations for Design of a Maxillary Expansion Device

3:50 – 5:10 pm

**Student Podium Presentation Session #3****Session Chair:** Dr. Kristina Rinker, University of Calgary

Bill Ke Gu	14	Collagen Fiber Reinforcement and Fluid Pressurization in Knee Joint
Kathryn Boon	15	Stem Cell Aggregate Characterization Using a Large Particle Flow Cytometer
Minggan Li	16	Influence of Nozzle Geometry on Cell Damage in the Bio-Dispensing Process
Arnold Wong	17	Concurrent Measures of Muscle Activity and Stiffness in the Lumbar Spine
Dale Ward	18	Finite Element Model Reconstruction of Porcine Left Atrium of the Heart
Swathi Damaraju	19	Comparison of the intra- and inter-evaluator reliability of common surface topography parameters in persons with adolescent idiopathic scoliosis
Agnes Soos	20	Shear Stress Modulation of Gene Expression in Vascular Endothelial Cells

6:00 – 7:00 pm

**DINNER – Vistas Dining Room**

7:00 pm

**“THE GREAT CHALLENGE”** Max Bell Fish Bowl

7:15 pm

Joint UA, UC, UL Faculty Meeting – Max Bell, Room 252

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 #3: – Dr. Peter S. Allen, University of Alberta**

What's The Good Of In-Vivo Magnetic Resonance (In Biomedical Engineering)?

**Session Chair:** Dr. Janet Ronsky, University of Calgary

9:25 – 10:20 am

**Student Podium Presentation Session #4****Session Chair:** Dr. Michael Doschak, University of Alberta

- |                     |    |   |
|---------------------|----|---|
| Aliaa Rehan Youssef | 21 | Effects of Hind-Limb Muscle Weakness on Knee Osteoarthritis in Rabbits  |
| Poh Soo Lee         | 22 | Generating Stem Cell-Derived Cardiomyocytes using Heart Derived Extracellular Matrix in a 3-D Culturing Platform              |
| Patricia Nadworny   | 23 | Effect of nanosilver-derived solutions on cytokines, MMPs, growth factors, and apoptosis                                      |
| Jeremy Kooyman      | 24 | Cartilage Boundary Lubricating Properties of Native Proteoglycan 4 Purified from Normal Bovine Synovial Fluid                 |
| Laura Rose          | 25 | Basic Fibroblast Growth Factor-Related Pluripotency and Self-Renewal Pathways are not Conserved in Mouse Embryonic Stem Cells |

10:20-10:40 am

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

**Judges:** Drs. Jeff Dunn, Salvatore Federico – University of Calgary and Drs. Larry Unsworth, Vivian Mushahwar – University of Alberta, and Dr. Albert Cross - University of Lethbridge

10:40 – 11:25 am

**Student Podium Presentation Session #5****Session Chair:** Dr. Ed Vigmond, University of Calgary

- |                 |    |   |
|-----------------|----|---|
| Colleen Decker  | 26 | The effect of skin on the ability of a non-invasive vibration analysis tool to detect spine movement  |
| Graeme Campbell | 27 | Bone Quality is Partially Recovered after RANKL Administration in Rats by Increased Bone Mass on Existing Trabeculae: An in vivo micro-CT Study |
| Andrew Walsh    | 28 | Susceptibility Phase Imaging: Validation of a New Quantitative Imaging Measure for Brain  |
| Neal Austin     | 29 | <i>In Vivo</i> Skeletal Muscle Fibre Function During Cycling  |

11:25 – 11:30 am

**Closing Remarks – Dr. Alan Wilman & Dr. Michael S. Kallos**

11:30 – 12:00 pm

**AIF, University of Calgary Schulich School of Engineering, and University of Alberta Faculty of Engineering Undergraduate Award Presentations**

**Podium and Poster Prize Presentations – Sponsored by the NSERC CREATE Training Program for Biomedical Engineers for the 21<sup>st</sup> Century**

NSERC CREATE Prize presentations for Most Outstanding Student Posters  
Best Overall Poster, Most Creative Poster, Clearest Message Poster

NSERC CREATE Prize presentations for Most Outstanding Podium Presentations  
First Prize, Second Prize, Third Prize

Canadian Society of Biomechanics/Société canadienne de biomécanique  
Podium Presentation Prize  
Poster Presentation Prize

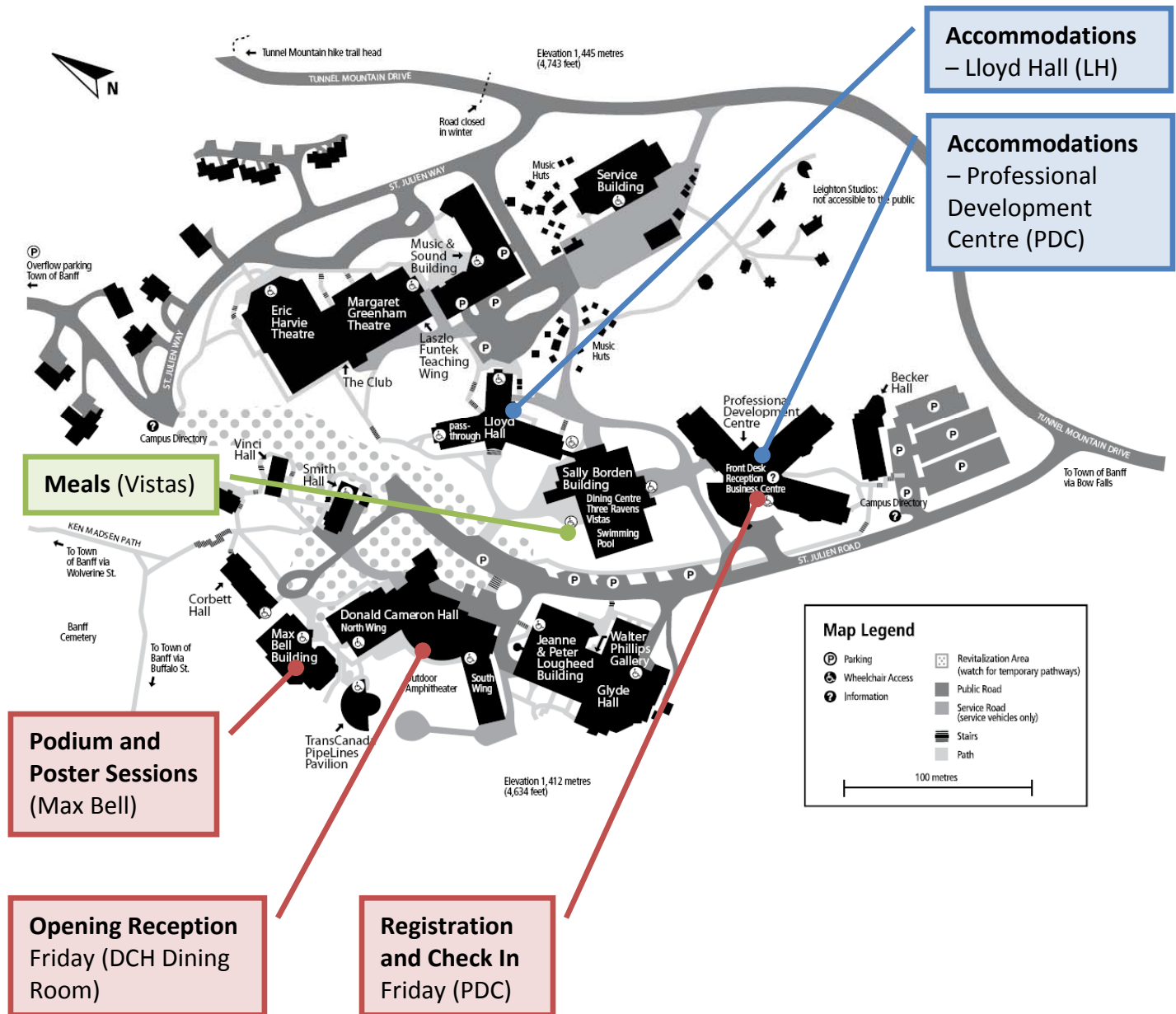
12:00 – 12:30 pm

**Pan-Alberta Initiative Presentation (Faculty)**

Dr. Rose Goldstein, Vice President (Research), University of Calgary

Dr. Andrew Greenshaw, Associate Vice President (Research), University of Alberta

## Map and Meeting Location





**Directions to Elk and Oarsmen (Saturday Social)**

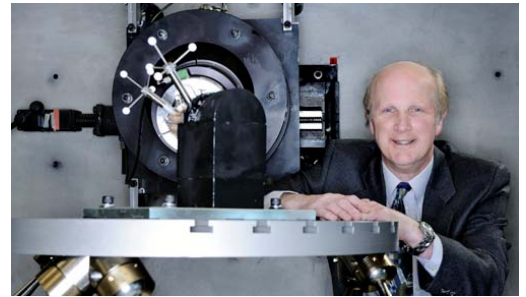
119 Banff Avenue (2nd Floor, Above The Ski Hub)





**Guest Speaker #1 – Dr. Nigel Shrive, University of Calgary****“Alternative Views”**

Sometimes we accept the status quo without question. The presentation aims to demonstrate that alternate views to current dogma may be viable and can produce interesting results. Examples will be given starting with the Provincial Coordinated Graduate Program in Biomedical Engineering, followed by ones drawn from the presenter's research experiences. The intent is to show students that when something does not seem quite right, even if it is "accepted" as the way things are, further investigation should not be ruled out.



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**Guest Speaker #2 – Dr. Peter Allen, University of Alberta****“What’s The Good Of In-Vivo Magnetic Resonance? (In Biomedical Engineering)?”**

My objective will be to try to illustrate the linkage between the clinical utility of magnetic resonance and the physics behind it. This might help non-practitioners of the art to perceive when NMR might provide some additional insights to their own research enquiries.

After a brief introduction to the key physical interactions at play when NMR is applied to the body, I shall outline several illustrative examples of their exploitation, including neurosurgical planning, and the investigation of metabolism.





## Industry Panel

**Jaret Hargreaves**, Product Manager, Calgary Scientific Inc.

Jaret Hargreaves is the Product Manager at Calgary Scientific Inc. for the ResolutionMD Mobile product, currently being used in clinical trials for acute stroke care. He is a graduate of the Biomedical Engineering program at the University of Calgary. Jaret's thesis demonstrated that anisotropic diffusion filtering of stroke imaging reduced variability in acute stroke diagnosis.

Calgary Scientific Inc.'s flagship products – the PureWeb™ platform and the ResolutionMD™ product family – provide access to medical images without downloading any software or data, on a broad variety of end user devices, including the iPhone. Since image data is read directly from PACS, no downloading of copies is required and physician can access studies faster, providing improved patient care.



PureWeb is a breakthrough medical application platform that enables the delivery of ResolutionMD's powerful advanced visualization tools and sophisticated clinical modules – PLUS web-enables third-party applications – all on a single unified platform to virtually any networked computer through a simple browser interface. ResolutionMD Mobile delivers anytime, anywhere access to the functionality of the ResolutionMD product family directly to mobile devices, including the iPhone. The client/server architecture allows for handling of large medical imaging data sets and application performance previously limited to expensive, proprietary workstation solutions. ResolutionMD Mobile provides physicians immediate access to critical medical imaging results, reducing the time required to make clinical decisions in acute care situations including trauma, acute chest pain, and stroke.

The original concepts for the core ResolutionMD product came from a team of researchers consisting of image scientists, medical doctors and computer scientists at the University of Calgary Medical Centre. Calgary Scientific currently has several notable luminary site customers, including Yale School of Medicine, USC's Keck School of Medicine, and Foothills Medical Centre. The company has 8 U.S. Patents Issued, 5 Patent Applications, and 8 Provisional Applications.

## Industry Panel

**Brent King**, Vice President of Operations, TENET Medical Engineering, Inc.

TENET Medical Engineering, Inc. is a dynamic manufacturer of Innovative Arthroscopic and Orthopaedic Positioning Products. The organization is focused on developing unique solutions to patient positioning issues in the OR. Through surgeon and OR staff expertise and input they have developed and brought to market several successful products. Tenet Medical was listed as the 107 fastest growing Canadian company in 2008 by Profit Magazine with 20% growth through recessionary times. Brent King is Vice President of Operations and Co Owner of TENET Medical Engineering. He carries 14 years experience in the development of Class I Medical Devices. Brent leads a team of 25 Engineers and technical staff in the design, manufacture and sales of over 40 medical products into 50 countries throughout the world. TENET's marquee product The SPIDER Limb Positioner was invented and patented by Brent, a product used to position patients for a multitude of procedures. Recently he was awarded the Manning innovation award for the development of the SPIDER. Brent graduated in 1993 with a BSC in Zoology from the University of Calgary followed ,in 1996, by a BaSC in Mechanical Engineering from the University of British Columbia. He serves on two academic boards, The Center for Integrative Biomedical Technology (UofC) and The External Research Advisory Board (UofC). In his spare time he enjoys time spent with family, snowboarding, and motorcycles.



## Industry Panel

**Arunas Salkauskas**, Senior Scientist, Imaging Dynamics Company

Imaging Dynamics Company was incorporated in 1995 to commercialize a digital x-ray capture system invented in Calgary by Robin Winsor for medical and veterinary applications. To date, IDC has over 2000 installations globally, in fact they're in every continent except Antarctica!

Arunas Salkauskas started to work with IDC in 2000 as a consultant developing image processing algorithms. In 2003, he joined the company full-time as the Software & IT Manager. He now holds the dubious title of 'Senior Scientist'. In this role he works closely with all teams collaborating on product development, getting involved in all aspects from mechanical design to software.



## Notes

## Notes



Notes:



# 10<sup>th</sup> Alberta Biomedical Engineering Conference - Banff 2009



UNIVERSITY OF  
ALBERTA



UNIVERSITY OF  
CALGARY



October 23 – 25, 2009  
The Banff Centre  
Banff, AB

## SUMMARY

**Total conference attendance = 195 Records (including guests/spouses)**

University of Alberta	Attendance
Faculty Members	16
Graduate Students	25
Undergraduate Students	13
<b>TOTAL Attendance</b>	<b>54</b>

University of Calgary	Attendance
Faculty Members	18
Graduate Students	50
Undergraduate Students	26
<b>TOTAL Attendance</b>	<b>94</b>

University of Lethbridge / University of Saskatchewan	Attendance
Faculty Members	2
Graduate Students	4
Undergraduate Students	0
<b>TOTAL Attendance</b>	<b>6</b>

**TOTAL = 154**

(does not include guests/spouses/other special guests)

**Guest Speakers / Industry Panel = 5**

Nigel Shrive, U of Calgary

Peter Allen, U of Alberta

Industry Panel –

**Jaret Hargreaves**, Product Manager, Calgary Scientific Inc.

**Brent King**, Vice President of Operations, TENET Medical Engineering, Inc.

**Arunas Salkauskas**, Senior Scientist, Imaging Dynamics Company

**Attending sponsors:**

NSERC CRSNG – NSERC CREATE Training Program for Biomedical Engineers for the 21<sup>st</sup> Centre

TENET Medical Engineering

BOSE, Electro Force Systems Group

BME Graduate Program

University of Alberta, Engineering

University of Calgary, VPR Office

Schulich School of Engineering, CBRE

**Non-attending sponsors:**

Alberta Ingenuity Fund

MR Solutions Ltd

Walsh Wilkins Creighton, LLP

APEGGA

Schulich Student Activities Fund

Societies offering student presentation awards: Canadian Society for Biomechanics – 2 awards

Award Recipients:

Canadian Society for Biomechanics Award (Podium) – Kevin Unrau, U of Alberta

Canadian Society for Biomechanics Award (Poster) – Brad Holinski, U of Alberta

Most Outstanding Podium Awards

1<sup>st</sup> place – Graeme Campbell, U of Calgary

2<sup>nd</sup> place – Swathi Damaraju, U of Calgary

3<sup>rd</sup> place – Sana Vahidy, U of Alberta

Poster Awards

Clearest Message Poster – Brandon Hisey, U of Calgary

Most Creative Poster – Caitlin Logan, U of Calgary

Best Overall Poster – Patrick Boyle, U of Calgary

Number of student podium presentations = 29

Number of student poster presentations = 36