



BRIDGING THE GAP

FROM DISCOVERY TO INNOVATION

**31st Annual Meeting of the
Canadian Biomaterials Society**

Halifax • Nova Scotia • June 4-7, 2014

OUR SPONSORS

INDUSTRY SPONSORS

stryker[®]



GOVERNMENT FUNDING



ACADEMIC PARTNERS





Bridging the Gap

From Discovery to Innovation

31st Annual Meeting of the
Canadian Biomaterials Society

WELCOME LETTER

Dear Colleagues,

On behalf of the Organizing Committee, I am pleased to welcome you to the 31st Annual Meeting of the Canadian Biomaterials Society. *"Bridging the Gap" – From Discovery to Innovation* will provide a forum for sharing the latest findings in biomaterials research, device development and novel clinical applications as we work to realize evidence-based solutions to biomedical problems.

The Organizing committee has worked hard to put together an action-packed program – from the Pre-Conference Workshop on Regulatory Issues in Tissue Engineering sponsored by the NSERC CREATE Program in Regenerative Medicine, to our inaugural Lunch & Learn sessions and reprised "Speed-Networking Workshop". We are also very pleased and honored to welcome, with the support of CIHR's Institute for Musculoskeletal Health and Arthritis, a roster of internationally renowned plenary and keynote speakers, including Dr. Jeffrey Karp from the Harvard Medical School, Dr. Andrés Garcia from the Georgia Institute of Technology, Dr. Jürgen Groll from the University of Würzburg (Germany), Dr. Sukyoung Kim from Yeungnam University (South Korea), and Drs. Michael Dunbar and Jason Berman from our own Dalhousie University. And, of course, we have a full slate of predominantly student-led oral and poster presentations taking place over the next two and half days covering a broad range of biomaterials-related topics.

Please take the time to visit our technical exhibit, where many of our sponsors will be happy to answer any questions you may have regarding their products. We are extremely grateful to all of our sponsors, including our academic partners, whose generosity made it possible for us to hold this meeting and to make this event such a success! We are also indebted to our Advisory and Scientific committees for their sage advice and assistance in shaping the program.

Finally, we hope that you will take the time to re-connect with old colleagues and friends (and make at least one or two new ones!) at our social events, starting with the Welcome reception at the University Club Pub and continuing through to our 'gala' at Pier 21 and a quintessential Nova Scotian social (minus the kitchen) the following day at the Garrison Brewery for our 'young' (and young at heart?) attendees. And if this is your first visit to Halifax, make sure you leave some time afterwards to explore the history and landscape of this wonderful city and province.

It has been 13 years since our last meeting in Halifax, but we think it has been worth the wait! We hope that you will find this meeting and our fair city both memorable and enjoyable.

Sincerely,

Mark Filiaggi, PhD
Professor and Associate Vice-President Research, Dalhousie University
CBS 2014 Conference Chair



Organizing Committee

| | |
|--|---|
| Mark Filiaggi, PhD (Chair) | Dalhousie University |
| Robert Abraham, MD, FRCSC, BSc | Dalhousie University and QE2 Health Sciences Centre |
| Daniel Boyd, PhD | Dalhousie University |
| Patricia Comeau (Student Representative) | Dalhousie University |
| Michael Dunbar, MD, FRCSC, PhD | Dalhousie University and QE2 Health Sciences Centre |
| J. Michael Lee, PhD, FBSE | Dalhousie University |

Advisory Committee

| |
|---|
| Isabelle Catelas, PhD (University of Ottawa) |
| Todd Hoare, PhD (McMaster University) |
| Rosalind Labow, PhD (University of Ottawa and the University of Ottawa Heart Institute) |

Scientific Committee (Abstract Reviewers)

| | |
|---------------------|--------------------|
| Brian Amsden | Sophie Lerouge |
| Marianne Ariganello | Diego Mantovani |
| Daniel Boyd | Amin Rizkalla |
| Isabelle Catelas | Paul Santerre |
| Paul Dalton | Maryam Tabrizian |
| Mark Filiaggi | Hasan Uludag |
| Lauren Flynn | Larry Unsworth |
| Kathryn Grandfield | Rizhi Wang |
| Paul Gratzner | Sarah Wells |
| Todd Hoare | Stephanie Willerth |
| Jay Kizhakkedathu | Tom Willett |
| Rosalind Labow | Ze Zhang |
| J. Michael Lee | |

Table of Contents

| | |
|--------------------------------|-------------------|
| Conference Information | 3 |
| Social Program | 4 |
| Special Sessions and Workshops | 5 |
| Program Schedule | |
| Wednesday, June 4 | 7 |
| Thursday, June 5 | 7 |
| Friday, June 6 | 11 |
| Saturday, June 7 | 15 |
| Poster Presentations | 18 |
| Campus and Halifax Map | Inside back cover |



CONFERENCE INFORMATION

Registration

Conference registration will be available at the Welcome Reception (University Club Pub) on Wednesday, June 4th from 6:00p to 9:30p. From Thursday, June 5th a Registration / Information desk will be located in the lobby of the McCain Building. The desk will be attended during the following hours:

Thursday, June 5: 7:30a - 4:30p • Friday, June 6: 7:30a - 6:30p • Saturday, June 7: 7:30a - 1:00

Name Badges

All registered conference participants will be issued a name badge, ticket(s) for the conference banquet dinner, a drink ticket for the pre-dinner cocktail hour, and a portfolio containing the conference program and other local tourist information. Badges should be worn at all times in the session rooms as well as in all common areas (McCain Lobby and Food station area) being utilized for the meeting.

Internet Access

General wireless internet access is available through the 'Dal' network (search using your Wi-Fi browser). Note that this is not a secure network with variable signal strength quality. For secured wireless access, choose 'Dal-WPA2' as your network and enter the individualized username and password provided in your registration package.

Directions to the Main Campus of Dalhousie University and Public Transit

Please visit <http://campusmaps.dal.ca> for directions to the main campus (where the meeting is taking place) as well as for information on how to access the main campus by public transit. A map of the Dalhousie campus in relation to downtown Halifax is provided on the inside back cover of the program.

Parking on the Campus of Dalhousie University

Visitors can purchase daily or weekly general parking permits at the Security Services office or use Dalhousie or Halifax Regional Municipality parking meters, located on and around campus. Registrants staying at the Risley Hall accommodations can receive complimentary on-campus overnight parking (one permit, per room, per night). Please see the Risley Hall Front Desk for more information.

Food / Breakfast Options

Tim Horton's and Pete's ToGoGo are located in the Student Union Building across the boulevard from the McCain Building. You will also find a Second Cup and Subway in the food court of the Killam Library, adjacent to the McCain Building.

SOCIAL PROGRAM

Welcome Reception

Wednesday, June 4th, 6:30p - 10:00p

University Club Pub

Conference participants are invited to attend the Welcome Reception at the University Club Pub on Dalhousie's main (Studley) campus (see map, inside back cover). Catch up with old friends or make some new ones! Specialty pizzas and other casual fare will be served, and drinks will be available for purchase. A registration and information desk will be open during the reception.

Conference Banquet

Thursday, June 5th, 6:30p - 7:30p (Cocktails), 7:30p – 11:00p (Dinner)

Pier 21

Join us for the annual CBS conference banquet at historic Pier 21. From the late twenties to the early seventies, Pier 21 was Canada's 'front door' to over a million immigrants, refugees, troops, wartime evacuees, war brides and their children. It has been compared to New York's Ellis Island, and is intrinsically linked to Canada's multicultural national identity. Explore the Canadian Museum of Immigration (Rudolph P. Bratty Exhibition Hall) during cocktail hour (one free drink ticket included), followed by a buffet dinner and entertainment in beautiful Kenneth C. Rowe Heritage Hall. This event is included in your registration, but pre-registration is required.

Student Social Get-Together

Friday, June 6th, 7:00p - 8:30p

Garrison Brewery

All students and young researchers are invited to a social evening with some Atlantic flavour at the Garrison Brewery. Located downtown near the Port of Halifax (1149 Marginal Road), this locale is well known for its handcrafted ales and will provide a great backdrop for this mixer! Appetizers and non-alcoholic options will also be available. We will meet in the lobby of the McCain building at 6:30 PM to walk over to the Brewery (but alternatively you can just meet us there!). There will be a "nominal" charge for this event. *Please sign up at the Registration Desk by Thursday morning, June 5th so that we can confirm our numbers for this event.*

SPECIAL SESSIONS AND WORKSHOPS

Workshop on Regulatory Issues in Tissue Engineering & Regenerative Medicine

Wednesday, June 4th, 09:00a - 4:00p (Pre-Registration required)

Dentistry Building, Dalhousie University

Leaders:

Dr. Ian Aldous, Therapeutic Products Directorate, Health Canada

Dr. J. Michael Lee, School of Biomedical Engineering, Dalhousie University

Sponsored by the NSERC CREATE Program in Regenerative Medicine (NCPRM), this workshop for NCPRM trainees and registered non-NCPRM CBS trainees will examine (1) The Principles of Safety and Effectiveness as Applied to Regenerative Medicine; (2) Regulatory Approaches to Regenerative Therapies in Canada, the United States & the EU; (3) GMP and Regenerative Medicine; and (4) Defining Performance Expectations for Critical Tissue Engineered Therapies. Case Studies from Researcher-Entrepreneurs will be provided. Registration is free for NCPRM trainees and \$40 for non-NCPRM CBS trainees, payable on site.

Poster Sessions / Exhibit

Thursday, June 5th, 12:15a - 2:00p • Friday, June 6th, 5:00p - 6:30p

Lobby, Scotiabank Auditorium, McCain Building

Join us for two interactive sessions on Thursday and Friday (held over Lunch and an Evening Reception, respectively), where you can engage in some lively discussion with our poster presenters. Presenters with odd-numbered posters will be required to be at their posters from 12:30p-1:15p on Thursday, June 5th, and for the whole poster session on Friday, June 6th. Presenters with even-numbered posters will be required to be at their posters from 1:15p-2:00p on Thursday, June 5th, and for the whole poster session on Friday, June 6th. Take some time as well to interact with our industry partners and learn more about their innovative products and services.

“Speed-Networking” Workshop

Thursday, June 5th, 4:30p - 5:30p

Cameron Room, Howe Hall

A student-focused event, this session will enable you to expand your professional network by providing an opportunity to meet professors, researchers and industry representatives in a relaxed environment. Like the speed-dating premise on which it is based, you will move from table to table every 5 minutes, with a chance to add 12 new contacts to your network. This will be a fun event; don't miss out! Please sign up at the Registration Desk.

Lunch & Learn Sessions

Friday, June 6th, 12:15p - 1:30p (Pre-Registration required)

These sessions will provide some focused but informal discussion in a small group setting on topics of relevance to the biomaterials community. These sessions are free to conference registrants; however, pre-registration is required.

Lunch & Learn Sessions *continued*

Commercializing University-Based Research

Facilitator: Dr. Daniel Boyd, Dalhousie University *Room 2016, McCain Building*

This lunch and learn will feature a university based researcher with experience in licensing and spin out companies. During the session, you will learn about the mechanisms by which you can commercialize a research idea. You will learn about the pitfalls, advantages and strategies associated with each approach, as well as a very simple tool that will help you to assess if a new research idea has commercial potential. The lunch and learn will be informal and highly interactive. Real cases will be used to illustrate key learning points.

Enriching the Biomaterials Classroom Experience: Facilitating More Engagement with Less Marking

Facilitator: Dr. Marianne Ariganello, University of Ottawa *Room 2017, McCain Building*

Increasing class sizes may require tweaking of the traditional course framework, while new trends in pedagogy are promoting increased student engagement. What strategies can we use to reconcile these issues when teaching biomaterials? Is there a simple way to add a design component into our classes? Share your ideas, your experiences (as a student or an instructor) – and even your failed attempts – at building a more comprehensive biomaterials education.

An Applied Science Approach to An Academic Career

Facilitator: Dr. Paul Santerre, University of Toronto *Room 2021, McCain Building*

The evolution of the knowledge based society in Canada is enabling more professionals to pursue careers within industry, without solely working for large pharma or technology intensive corporations such as J&J, Dupont, 3M, and GE, and in some cases while not necessarily compromising their academic careers. More opportunities for combining niche needs, insightful and deep knowledge, and innovative solutions to practical problems in the biomedical devices sector are giving rise to an increased number of trainees considering putting their Masters, PhDs and postdoctoral experience to work as key employees in spin-off companies, or running entrepreneurial ventures with their own technological ideas. Two topics will be discussed: 1) recognizing low-hanging technological niche product opportunities while pursuing innovative discovery science; and 2) creative approaches to managing spin-off companies while still achieving performance in your academic career.

What's Taking Tissue Engineering So Long?

Facilitator: Dr. J. Michael Lee, Dalhousie University *Room 2130, McCain Building*

The last two decades have been punctuated with bold statements from tissue engineering leaders suggesting that the era of off-the-shelf engineered organ and tissue replacements was imminent. With the passing years, a great deal of the gas has gone out of that particular party balloon and fewer research teams are willing to promise any defined timeline for complex replacements. One might reasonably ask what happened. After capturing the imagination of scientists and the public, why has this endeavour turned out to be much harder than it was imagined to be? At this session, we'll explore a set of issues that have impeded rapid progress. As tissue engineering has morphed into a branch of regenerative medicine, what strategic choices could we now make to accelerate success?

CBS Annual General Meeting

Friday, June 6th, 1:30p - 2:45p

Scotiabank Auditorium, McCain Building

At the Annual General Meeting, CBS members will be updated on CBS activities and progress during the past year. Our plans for the coming year will also be discussed. Another important activity will be the nomination of candidates for CBS President-Elect and the Board of Directors.

Wednesday, June 4 – Schedule

- 9:00a - 4:00p **Workshop on Regulatory Issues in Tissue Engineering & Regenerative Medicine**
Dentistry Building
- 6:00p - 9:30p **CBS Registration**
University Club Pub
- 6:30p - 10:00p **Welcome Reception**
University Club Pub

Thursday, June 5 – Schedule

Plenary Presenter – 8:30a

Harnessing Engineered Cell and Tissue Adhesion for Medical Applications



Jeffrey M. Karp, PhD

*Associate Professor, Harvard Medical School & Brigham and Women's Hospital
Principal Faculty, Harvard Stem Cell Institute*

This talk will explore technologies that are currently being developed in the Karp Lab to tackle numerous medical problems, namely: sealing tissues/closing wounds, achieving long term local drug delivery for treatment of diseases such as inflammatory arthritis, and development of surfaces to separate cells for disposable point of care diagnostics. In addition, an mRNA transfection strategy using cells for targeted delivery of biologics will be discussed, as will approaches to engineer cells with an intracellular depot of phenotype altering agents that can be used for drug delivery or programming cell fate via both intracrine-, paracrine-, and endocrine-like mechanisms. The talk will examine methods to enhance the engraftment of infused stem cells through a surface engineering approach to induce a robust rolling response, and the potential of nano-engineered sensors immobilized on the cell surface that can be used to detect signals within the cellular nano-environment with unprecedented spatial and temporal resolution that should be useful for elucidating niche biology in vivo and for drug discovery.

Keynote Presenter – 2:00p

New biomaterials offer new promises for complex arthroplasty reconstruction: observations from the coal face



Dr. Michael Dunbar, MD, PhD, FRCSC

*Professor, Department of Surgery, Division of Orthopaedic Surgery,
Dalhousie University & the QE2 Health Sciences Centre*

Hip and knee arthroplasty surgery provides outstanding improvement in function and quality of life for millions around the globe. With continued success, indications for arthroplasty have been extended into younger patients and older patients, hence increasing the incidence and prevalence of arthroplasty. Older patients present challenges as their bone is generally weaker, while younger patients present challenges related to increased biomechanical forces over the joint and a need for increased survivorship, presenting an inherent paradox. The biomaterials of the last few decades have brought us this far, but now that previous implants are failing after decades in situ, and younger patients are requiring multiple revisions to get them through, new biomaterials are required. Fortunately, there has been a recent proliferation in imaging and biomechanical assessment tools that allow for a deeper understanding of the local biomechanical conditions at the joint, in a patient specific fashion, that give insight into the required form and function of future implants and augments. Finally, advanced manufacturing processes, such as 3D printing, allow for the production of new, but better rationalized shapes of implants with advanced fixation and load handling properties. Ultimately, implants will need to be fashioned from radically different biomaterials, and biomaterials research will continue to play a major role.

8:15a Opening Remarks

8:30a **PLENARY 1** Scotiabank Auditorium

Harnessing Engineering Cell and Tissue Adhesion for Medical Applications

Jeffrey M. Karp, PhD, Harvard Medical School of Brigham and Women's Hospital

SESSION 1 – WOUND HEALING Scotiabank Auditorium

Moderators: Larry Unsworth, PhD; Nima Khadem Mohtaram

9:30a **The delivery of pulsed electrical field via conductive polymer fabric activates dermal fibroblasts promoting wound healing**

Yongliang Wang, Laval University

9:45a **Effect of polar, hydrophobic, and ionic polyurethane character on adsorbed IgG-mediated monocyte activation**

Kyle Battiston, University of Toronto

Battiston, Kyle; Ouyang, Ben; Honarparvar, Eilyad; Qian, Jenny; Labow, Rosalind; Simmons, Craig; Santerre, Paul

10:00a **Self-Propelling Hemostatic Particles**

James R. Baylis, University of British Columbia

Baylis, James R; Yeon, Ju Hun; Thomson, Max H; Kazerooni, Amir; Lee, Anna; Zhang, Jesse Q; Kastrop, Christian J

10:15a **Granulation-tissue biomimetic scaffolds induce the proliferative/pro-fibrotic phase of skin healing**

Douglas Hamilton, The University of Western Ontario

Elliott, Christopher; Li, , Xiaofei; Dunmore-Buyze, Joy; Drangova, Maria; Forbes, Thomas; Guan, Jianjun; Leask, Andrew; Hamilton, Douglas

10:30a Nutrition Break *McCain, Upper Lobby*

Sessions 2 and 3 run concurrently

SESSION 2 – Therapeutic Delivery 1 *Scotiabank Auditorium*

Moderators: Rizhi Wang, PhD; Juliana Valencia-Serna

11:00a **Incorporating Strontium Improves Therapeutic Potential of Calcium Polyphosphate Delivery Matrices for Osteomyelitis Treatment**

Patricia Comeau, *Dalhousie University*

Comeau, Patricia A; Filiaggi, Mark J

11:15a **pH-Responsive Calcium Phosphate-Polymer Nanoparticles as a Drug Delivery System in Gene Therapy**

Gregor Doerdelmann, *University of Duisburg-Essen*

Doerdelmann, Gregor; Kozlova, Diana; Matthias, Epple

11:30a **Controlled Delivery of Fibroblast Growth Factors from Protein-analog Fibers for Therapeutic Angiogenesis**

Somiraa Said, *The University of Western Ontario*

Said, Somiraa S; Pickering, J. Geoffrey; Mequanint, Kibret

11:45a **Development of a Drug Delivery System by Plasma at Atmospheric Pressure**

Morgane Laurent, *Laval University*

Laurent, Morgane; Köhler, Julia; Sabbatier, Gad; Hoesli, Corinne; Gherardi, Nicolas; Laroche, Gaëtan

12:00p **Magnetic Plum Pudding Hydrogels for Controlled, Pulsatile Drug Release**

Danielle Maitland, *McMaster University*

Maitland, Danielle; Campbell, Scott; Hoare, Todd

SESSION 3: Tissue Engineering 1 [Cells/ECM] *Ondaatje Theatre*

Moderators: Mahmoud Rouabhia, PhD; Meghan Wright

11:00a **Melt Electrospun Microfiber Scaffolds with Novel Architecture for Neuronal Differentiation of Human Induced Pluripotent Stem Cells**

Nima Khadem Mohtaram, *University of Victoria*

Khadem Mohtaram, Nima; Ko, Junghyuk; King, Criag; Montgomery, Amy; Sun, Lin; Vasandani, Rishi; Jun, Martin Byung-Guk; Willerth, Stephanie

11:15a **Tri-Culture of Vascular Cells Promotes Vascular Tissue Remodeling**

Caroline Loy, *Université Laval*

Loy Caroline; Levesque Lucie; Kizhakkedathu Jayachandran N; Mantovani Diego

11:30a **Adipose-Derived Stem Cells Enhance the Angiogenic and Adipogenic Potential of Decellularized Adipose Tissue in vivo**

Tim Tian Han, *Queen's University*

Han, Tim Tian Y; Toutounji, Sandra; Amsden, Brian G; Flynn, Lauren E

11:45a **Conditions for the Co-culture of Human Gingival Fibroblasts and Vascular Endothelial Cells (HUVECs) in a Perfused Polyurethane (D-PHI) Scaffold**

Jane W.C. Cheung, *University of Toronto*

Cheung, Jane WC; Jain, Devika; McCulloch, Christopher AG; Santerre, J. Paul

12:00p **Encapsulated Polymeric Microspheres for Promoting Neural Differentiation of Pluripotent Stem Cells**

Nima Khadem Mohtaram, *University of Victoria*

Edgar, John; Gomez, Jose Carlos; Montgomery, Amy; Khadem Mohtaram, Nima; Willerth, Stephanie

12:15p **LUNCH, POSTER SESSIONS & EXHIBITS** (Poster Presentations listed on pg 18)

McCain Lobby, Scotiabank Auditorium

BRIDGING THE GAP – FROM DISCOVERY TO INNOVATION

2:00p **KEYNOTE PRESENTATION** *Scotiabank Auditorium*

New biomaterials offer new promises for complex arthroplasty reconstruction: observations from the coal face

Dr. Michael Dunbar, *Dalhousie University and the QE2 Health Sciences Centre*

Sessions 4 and 5 run concurrently

SESSION 4: Orthopaedic & Dental Biomaterials 1 *Scotiabank Auditorium*

Moderators: Mehdi Kazemzadeh-Narbat, PhD; Felipe Eltit

3:00p **Corrosion and Oxidation Analyses on metal-on- polyethylene total hip implants retrieved due to pseudotumor formation**

Qiong Wang, *The University of British Columbia*

Wang, Qiong; Eltit, Felipe; Duncan, Clive P; Garbuz, Donald S; Greidanus, Nelson;

Masri, Bassam A; Wang, Rizhi

3:15p **In Vitro Simulation of Modular Neck Fracture, Wear, Corrosion, and Distraction in Total Hip Replacements**

Fahad Aljenaie, *University of Ottawa*

Aljenaie, Fahad; Louati, Hakim; Beaulé, Paul E; Catelas I; Nganbe, Michel

3:30p **Ribose Pre-Treatment Protects The Strength and Ductility of Irradiation-Sterilized Human Bone Allograft**

Thomas Willett, *University of Toronto / Mount Sinai Hospital*

Willett, Thomas L; Woodside, Mitchell

3:45p **Investigation causes of Pseudotumor formation in metal-on- highly cross-linked polyethylene total hip arthroplasty**

Qiong Wang, *The University of British Columbia*

Wang, Qiong; Wang, Rizhi

SESSION 5: Cardiovascular Biomaterials *Ondaatje Theatre*

Moderators: Stephanie Willerth, PhD; Caroline Loy

3:00p **Blood Compatibility of Degradable Polar Hydrophobic Ionic Polyurethane (D-PHI) Designed for Blood Contact Applications**

Kathryne Brockman, *University of Toronto*

Brockman, Kathryne S; Kizhakkedathu, Jayachandran N; Santerre, J. Paul

3:15p **Designing Multifonctionnal Nanofiber Scaffold for Endothelial Cells Adhesion and Proliferation on Vascular Substitutes**

Gad Sabbatier, *Laval University/ Centre de recherche du CHU de Québec*

Sabbatier, Gad; Larrañaga, Aitor; Ko Na Re; Cunningham, Alexander; Guay-Bégin, Andrée-Anne;

Fernandez, Jorge; Oh, Jung Kwon; Sarasua, Jose-Ramon; Laroche, Gaétan

3:30p **Calcification Reduction in Pericardium for Bioprosthetic Heart Valves**

Asha Parekh, *University of Western Ontario*

Parekh, Asha; Talman, Eric; Umoh, Joseph; Wan, Wankei

3:45p **In Vitro Degradation of Polyphosphate Gels**

Arash Momeni, *Dalhousie University*

Momeni, Arash; Filiaggi, Mark J

4:00p **Nutrition Break** *McCain, Upper Lobby*

4:30p **Speed-Networking Workshop** *Cameron Room (Howe Hall)*

6:30p **CBS Banquet** *Pier 21 (6:30 - Cocktails/Museum, 7:30 - Dinner)*

Friday, June 6 – Schedule

Plenary Presenter – 8:30a

Biofunctional Hydrogels for Cell Delivery and Tissue Repair



Andrés J. García, PhD

Regents' Professor, Woodruff School of Mechanical Engineering

Petit Institute for Bioengineering and Bioscience

Georgia Institute of Technology

Hydrogels, highly hydrated cross-linked polymer networks, have emerged as powerful synthetic analogs of extracellular matrices for basic cell studies as well as promising biomaterials for regenerative medicine applications. A critical advantage of these artificial matrices over natural networks is that bioactive functionalities, such as cell adhesive sequences and growth factors, can be incorporated in precise densities while the substrate mechanical properties are independently controlled. We have engineered poly(ethylene glycol) [PEG]-maleimide hydrogels to incorporate VEGF as supportive matrices to improve pancreatic islet vascularization and engraftment. PEG-maleimide were functionalized with RGD peptide and VEGF and cross-linked into a hydrogel by addition of collagenase-degradable peptides. These hydrogels supported in vitro islet survival, insulin production, and intra-islet endothelial cell sprouting. Importantly, islets delivered within these functionalized hydrogels exhibited improved engraftment, vascularization and insulin production compared to islets delivered within other hydrogels and without a hydrogel carrier. In another application, we functionalized hydrogels with the integrin-specific, collagen-mimetic triple helical peptide GFOGER to promote osteogenic differentiation and bone repair. Human mesenchymal stem cells adhered well and maintained viability on both RGD and GFOGER hydrogels. However, alkaline phosphatase activity and mineralization was higher on GFOGER-hydrogels than on RGD-hydrogels. GFOGER-functionalized hydrogels significantly enhanced bone volume and mass in critically sized, segmental bone defects in murine radii compared to other hydrogels and empty defects. These studies establish these maleimide-cross-linked hydrogels as promising biomaterial carriers for cell delivery, engraftment and enhanced tissue repair.

Keynote Presenter – 3:00p

Tankside to Bedside: Revolutionizing preclinical drug discovery in cancer using the zebrafish model



Dr. Jason Berman, MD, FRCPC, FAAP

MSC Clinician Scientist in Pediatric Oncology

Associate Professor, Departments of Pediatrics, Microbiology and Immunology and Pathology, Dalhousie University & The IWK Health Centre

The current preclinical pipeline for cancer drug discovery can be cumbersome and costly, which limits the number of compounds that can effectively be transitioned to the clinic. Moreover, there is a growing desire to develop targeted therapeutics to provide more personalized cancer treatment and less toxicity. Cell culture-based assays have been instructive but lack the critical context of the tumour micro-environment; while mouse xenografts are cost-prohibitive and require extensive engraftment time, obviating their use in personalizing therapy. The zebrafish has emerged as a powerful cancer model by virtue of conserved genetics and ease of scalability, where large numbers of rapidly developing externally-fertilized transparent embryos can be used to screen compounds in a high-throughput manner. We have pioneered an innovative zebrafish human tumor xenograft model, the speed and efficiency of which holds tremendous potential as a critical intermediary screening tool between in vitro and murine pre-clinical models. In addition, by providing in vivo drug responses to an individual patient's tumour in real time, it represents an unprecedented opportunity for a live animal model to influence and personalize cancer therapy. Applications of the zebrafish xenograft platform to study drugs targeting proliferation, metastasis, and angiogenesis in the context of several cancer types will be presented, as well as the contribution of this approach to the recent discovery of novel cardioprotectant compounds that prevent cardiac damage from chemotherapeutic agents without compromising tumour cytotoxicity.

8:30a **PLENARY 2** *Scotiabank Auditorium*

Biofunctional Hydrogels for Cell Delivery and Tissue Repair

Andrés J. García, PhD, Georgia State University

SESSION 6: Hydrogels *Scotiabank Auditorium*

Moderators: Lauren Flynn, PhD; Kathryn Brockman

9:30a **Evaluation of Composite Hydrogel Scaffolds Comprised of Methacrylated Chondroitin Sulphate and Decellularized Adipose Tissue of Varying Particle Size**

Cody Brown, University of Western Ontario

Brown, Cody; Yang, Jing; Amsden, Brian; Flynn, Lauren

9:45a **GNF (Glycosyl-Nucleosyl-Fluorinated)-Collagen injectable hydrogel for tissue engineering: a new scaffold for bone regeneration.**

Mathieu Maisani, Université Laval

Maisani, Mathieu; Levesque, Lucie; Chassande, Olivier; Ehret, Camille; Mantovani, Diego

10:00a **Modular and Injectable Poly(Oligoethylene glycol methacrylate)-Based Hydrogels With Tunable Protein and Cell Interactions**

Emilia Bakaic, McMaster University

Bakaic, Emilia; Smeets, Niels; Hoare, Todd

10:15a **Self-Assembling MMP-2 Cleavable Hydrogel Drug Delivery Systems**

Kyle Koss, *University of Alberta*

Koss, Kyle Michael; Unsworth, Larry D

10:30a Nutrition Break *McCain, Upper Lobby*

Sessions 7 and 8 run concurrently

SESSION 7 – Surface Modification *Scotiabank Auditorium*

Moderators: Donald Brunette, PhD; Patricia Comeau

11:00a **Mussel-inspired Ultrathin Film on Oxidized Ti-6Al-4V Surface for Enhanced Osseointegration and Antibacterial Capability**

Ziyuan Wang, *University of Manitoba*

Wang, Ziyuan; Ojo, Olanrewaju; Xing, Malcolm

11:15a **Osteoblastic cell interactions with nanoporous titanium surfaces**

Marianne Ariganello, *University of Ottawa*

Ariganello, Marianne B; Gerson, Eleanor; Nour, Elias; Ribeiro, Victor; Singla, Aarti; Variola, Fabio

11:30a **New approach of biomaterial design to enhance osteogenesis at the interface bone/implant**

Ibrahim Bilem, *Laval University*

Bilem, Ibrahim; Chevallier, Pascale; Durrieu Marie-Christine; Sone, Eli; Laroche Gaétan

11:45a **Development and characterisation of the stability of fibronectin coatings on fluorinated surfaces**

Ludivine Hugoni, *Laval University*

Hugoni, Ludivine; Montaña, Vanessa; Santerre, J.Paul; Pauthe, Emmanuel;

Mantovani, Diego

12:00a **Investigation on the Design and Development of Novel Antithrombotic and Anti-adhesion Coatings for Cardiovascular Applications**

Yan Mei, *University of British Columbia*

Mei, Yan; Yu, Kai; Lo, Joey; Lange, Dirk; Kizhakkedathu, Jayachandran N

SESSION 8: Tissue Engineering 2 (Polymeric Scaffolds) *Ondaatje Theatre*

Moderators: Brian Amsden, PhD; Emilia Bakaic

11:00a **Concentrically Fused Multi Layered Tubular Cell Seeded Collagen Construct for Vascular Tissue Engineering**

Dawit G. Seifu, *Laval University*

Seifu, Dawit G; Meghezi, Sébastien; Unsworth, Larry D; Mequanint, Kibret;

Mantovani, Diego

11:15a **Cell-compatible, photo-reversible and self-healing hydrogel for tissue engineering**

Lianlian Yu, *University of Manitoba*

Yu, Lianlian; Zhong, Wen; Xing, Malcolm

11:30a **In Vitro Degradation and Physical Characterization of Antimicrobial Electrospun Scaffolds with Aligned Fibers**

Meghan Wright, *University of Toronto*

Wright, Meghan; Yang, Meilin; Santerre, Paul

11:45a **BMP-7 release characteristics from a chitosan hydrogel for use with critical size defect**

Lamees Nayef, *McGill University*

Nayef, Lamees; Mina Mekhail; Hamdy, Reggie; Tabrizian, Maryam

12:15p **LUNCH AND LEARN SESSIONS (See page 5)**

1:30p **CBS ANNUAL GENERAL MEETING** *Scotiabank Auditorium*

BRIDGING THE GAP – FROM DISCOVERY TO INNOVATION

2:45p Nutrition Break *McCain, Upper Lobby*

3:00p **KEYNOTE PRESENTATION**

Tankside to Bedside: Revolutionizing preclinical drug discovery in cancer using the zebrafish model

Dr. Jason Berman, *Dalhousie University and the IWK Health Centre*

SESSION 9: Therapeutic Delivery 2 *Scotiabank Auditorium*

Moderators: Isabelle Catelas, PhD; Kyle Battiston

4:00p **NIR initiated and pH sensitive single-wall carbon nanotubes for doxorubicin intracellular delivery**
Junzi Jiang, *University of Manitoba*

4:15p **Lipid Modified Polymers as BCR-ABL siRNA Carriers for Growth Arrest in Chronic Myeloid Leukemia Cells**

Juliana Valencia-Serna, *University of Alberta*

Valencia-Serna, Juliana; Chan, Nicole; Yang, Xiaohong; Aliabadi, Hamid M; Parmar, Manoj B; Jiang, Xiaoyan; Uludag, Hasan

4:30p **Multimodal calcium phosphate nanoparticles for in vivo imaging and photodynamic therapy**
Diana Kozlova, *University of Duisburg-Essen*

Kozlova, Diana; Haedicke, Katja; Hilger, Ingrid; Eppler, Matthias

4:45p **Effect of polymer architecture and tunable PEG content on micro-structuration of polymeric nanoparticles**

Jean-Michel Rabanel, *Université de Montréal*

Rabanel, Jean-Michel; Hildgen, Patrice; Banquy, Xavier

5:00p **POSTER SESSION, EXHIBIT AND RECEPTION** *McCain Lobby and Scotiabank Auditorium*

7:00p **STUDENT SOCIAL** *Garrison Brewery*

Saturday, June 7 – Schedule

Plenary Presenter – 8:30a

Bioactivation and Morphology of Biomaterials as Complementary Triggers for Regenerative Medicine



Jürgen Groll, PhD

*Professor and Chair, Department of Functional Materials in Medicine and Dentistry
University of Würzburg*

Biointerface engineering of classical biomaterials such as orthopedic implants for specific bioactivation and optimized tissue ingrowth has initially directed biomaterials research. With the onset of tissue engineering, the aim to structurally and morphologically mimic the native environment of cells, the so-called extra-cellular matrix (ECM), has become a major research focus. In the ECM of connective tissue, cells adhere to polymeric protein fibers that serve as their mechanical scaffold. This interaction of cells with the ECM is highly regulated and controlled. Hence, together with degradability, both the activation of specific cell/material interactions and a three-dimensional environment that mimics the ECM biochemically and structurally are core challenges for advanced tissue engineering scaffolds. Nowadays, regenerative medicine has turned into the focus of biomaterials research, and many classical paradigms are challenged. The strategy of in situ tissue engineering starts to replace the classical approach of initial biopsies with subsequent in vitro culture of cell-scaffold constructs, and the use of 3D printing technologies allows the direct generation of hierarchical tissue-like structures. This also facilitates the design of in vitro tissue models, taken into account that dynamic co-culture systems are available that facilitate in vitro tissue ripening. The lecture will guide us through this development using the work performed in my department as examples. Special focus will be given to the changing role of surface activation of biomaterials and the promise of stringent morphology control for in situ regenerative materials, as well as the use of 3D printing technologies for bio-fabrication of tissue-like structures.

Keynote Presenter – 11:00a

Surface coating of dental implants using water glass for cell behavior



Sukyoung Kim, PhD

*Professor, School of Materials Science and Engineering
Yeungnam University, Gyeongsan, Korea*

Bone-to-implant osseointegration is usually affected by physical factors such as implant design and surface topography, and by chemical factors such as the chemical composition of the implant surface or the crystallographic structure of the coated materials. Several strategies have been developed focusing on the surface modification of implant roughness, because it has been demonstrated that the osteoblastic cells tend to attach more easily to rough surface, followed by increased bone apposition. Chemical modification of the implant surface has been also realized by alkaline treatment of titanium, bioactive coating with hydroxyapatite (HA), covalent attachment of an organic monolayer anchored by a siloxane network, or immobilization of specific adhesive peptides. It is known that the existence of functional groups such as Si-OH and Ti-OH on the Ti surface accelerates the formation of a bone-like apatite layer in simulated body fluid (SBF). In this talk, various surface modification techniques on commercially pure titanium (cp-Ti) will be introduced as alternatives to eliminate the problem of the long-term instability of plasma sprayed HA coating. First, roughened Ti surfaces were formed by polishing, blasting and scratching techniques using SiC papers, HA granules, and SiC papers, respectively. Next, the water glass (WG) coating on blasted Ti surface will be described in terms of the formation of Si-OH groups on the WG coated Ti surface. In order to evaluate the effects of surface roughness, surface chemistry, and hydrophilicity on bone or stem cell behaviors, cell attachment and proliferation were examined and compared. The WG coating on Ti surface showed the formation of Si-OH groups and the better hydrophilicity, and improved the behaviors of cell attachment and proliferation. Consequently, It is believed that the WG coating will be an excellent coating material for the initial bone attachment of dental implants to the adjacent bone.

8:30a **PLENARY 3** *Scotiabank Auditorium*

Bioactivation and Morphology of Biomaterials as Complementary Triggers for Regenerative Medicine

Jürgen Groll, PhD, *University of Würzburg*

SESSION 10: Biomimetic Materials *Scotiabank Auditorium*

Moderators: Paul Dalton, PhD; Jane Cheung

9:30a **Controlled Structural Tissue Organization and Mechanical Properties of Collagen Gel**

Scaffolds Through Cells Remodeling

Sébastien Meghezi, *Laval University*

Meghezi, Sébastien; Seifu, G. Dawit; Mantovani, Diego

9:45a **Novel Adhesive Proteins from Freshwater Zebra Mussels**

Arash Hanifi, *University of Toronto*

Hanifi, Arash; Manion, Joseph G; Rees, David J; Sone, Eli D

10:00a **Free Standing Cell Sheet Assembled with Ultrathin Extracellular Matrix as an Innovative Approach for Biomimetic Tissues**

Qingtao Li, *University of Manitoba*

Li, Qingtao; Chen, Jun

10:15a **Synthetic Dental Composite Materials Inspired by Shark Teeth**
Joachim Enax, *University of Duisburg-Essen*
Enax, Joachim; Fabritius, Helge; Prymak, Oleg; Raabe, Dierk; Epple, Matthias

10:30a Nutrition Break *McCain, Upper Lobby*

11:00a **KEYNOTE PRESENTATION**
Surface coating of dental implants using water glass for cell behavior
Sukyoung Kim, PhD, *Yeungnam University*

SESSION 11: Orthopaedic & Dental Biomaterials 2 *Scotiabank Auditorium*
Moderators: Tom Willett, PhD; Lauren Kiri

11:30a **Effects of reactive calcium phosphate levels on hydroxyapatite precipitation and antibacterial chlorhexidine release from dental composites**
Anas Aljabo, *Eastman Dental Institute, UCL*
Aljabo, Anas; Knowles, Jonathan; Young, Anne

11:45a **Sodium Carbonate-Doped Calcium Polyphosphate: Higher Mechanical Strengths and Faster Degradation Rate**
Youxin Hu, *University of Toronto*
Hu, Youxin; Grynpas, Marc D; Kandel, Rita A; Pilliar, Robert M

12:00p **Preliminary Evaluation of Germanium Based Glass Polyalkenoate Cements**
Brett Dickey, *Dalhousie University*
Dickey, Brett; Boyd, Daniel

12:15p **Histological analysis of pseudotumors associated with metal-on-metal hip implants**
Felipe Eltit, *University of British Columbia*
Eltit, Felipe; Wang, Qiong; Cox, Michael; Masri, Bassam; Garbuz, Donald; Greidanus, Nelson; Duncan, Clive; Wang, Rizhi

12:30p **BOXED LUNCH**

1:00p **AWARDS/CLOSING** *Scotiabank Auditorium*

Poster Presentations

Cell-Biomaterial Surface Interactions

Poster 1

Probing Bacterium-Substratum interactions by Quartz Crystal Microbalance with Dissipation (QCM-D)

Yinan Wang, *University of Alberta*

Wang, Yinan; Kianoush, Fariba; Narain, Ravin; Yang, Liu

Poster 2

Regulation of Macrophage Phenotype on Smooth and Rough Surfaces by Galectin-3

Fariba Kianoush, *University of British Columbia*

Poster 3

Effects of a novel grooved surface on RAW 264.7 Macrophage gene expression and cytokine secretion

Hai-Sle Moon, *University of British Columbia*

Moon, Hai-Sle; Wong, Angela TT; Waterfield, Douglas J; Brunette, Donald M

Poster 4

Lateral Boundary Mechanosensing by Adherent Cells in a Novel Collagen Gel System

Hamid Mohammadi, *University of Toronto*

Mohammadi, Hamid; Janmey, Paul A; McCulloch, Christopher A

Polymeric Scaffolds

Poster 5

Design of an Electrospun Collagen Scaffold for the Regeneration of Periodontal Tissues

Kendal I Creber, *University of Western Ontario*

Creber, Kendal I; Kim, Shawna; Guan, Jianjun; Hamilton, Douglas W

Poster 6

Withdrawn

Poster 7

3D Hyaluronan Hydrogels as Matrices for Spheroid Formation

Alexander EG Baker, *University of Toronto*

Baker, Alexander EG; Tam, Roger Y; Muthuswamy, Senthil; Shoichet, Molly S; Yoganathan, Karthika

Poster 8

Melt Electrospinning Writing of 3D Polycaprolactone Scaffolds with Defined Morphologies

Paul D. Dalton, *University of Wuerzburg*

Dalton, Paul D; Jungst, Tomasz; Hochleitner, Gernot; Groll, Jürgen; Brown, Toby D; Hutmacher, Dietmar W

Poster 9

Characterization of Electrodeposited Chitosan-PEO Blends (Ottawa)

Fabio Variola, *University of Ottawa*

Cassani, Davide AD; Ariganello, Marianne B; Altomare, Lina; De Nardo, Luigi; Variola, Fabio

Poster 10

A 'degradable' poly(vinyl alcohol) hydrogel

A. Dawn Bannerman, *University of Western Ontario*

Bannerman, A. Dawn; Liu, Jian; Wan, Wankei

Poster 11

Humidity effect on the structure of a core-shell nanofibrous scaffold for tissue regeneration applications

Adam Golin, *University of Western Ontario*

Golin, Adam; Wan, Wankei

Cardiovascular Biomaterials

Poster 12

Rheological Properties of Polyphosphate Gels

Arash Momeni, *Dalhousie University*

Momeni, Arash; Filiaggi, Mark J

Poster 13

A Multi-well Flow Chamber System for the Multifactorial Optimization of Vascular Biomaterials

Corinne A Hoesli, *Université Laval*

Hoesli, Corinne A; Tremblay, Catherine; Juneau, Pierre-Marc; Boulanger, Mariève; Brassard, Jonathan; Gaillet, Bruno; Duchesne, Carl; Ruel, Jean; Garnier, Alain; Laroche, Gaétan

Therapeutics / Drug Delivery

Poster 14

Polymeric Gene Delivery to Cord Blood Derived Mesenchymal Stem Cells (CB-MSC)

Cezary Kucharski, *University of Alberta*

Kucharski, Cezary; Rose, Laura; Uludag, Hasan

Poster 15

Reducible Polyamidoamine-magnetic Iron Oxide Self-assembled Nanoparticles for Doxorubicin Delivery

Wenbing Wan, *University of Manitoba*

Wan, Wenbing; Xing, Malcolm MQ; Jun, Chen

Poster 16

Astragalus Powder Extract Influences the Proliferation of Endothelial Cells

Dingkun Wang, *Université Laval*

Wang, Dingkun; Du, Zhiyong; Zhang, Ze

ECM Modulation

Poster 17

Covalent Attachment of Antibody to Electrically Conductive Poly(pyrrole-co-(1-(2-carboxyethyl)pyrrole)) Particles

Jifu Mao, *Université Laval*

Mao, Jifu; Zhang, Ze

Poster 18

Electrical stimulation through conductive PPy-PLLA material promoted fibroblast interacting with keratinocytes generating better organized human skin equivalent

Hyunjin Park, *Université Laval*

Park, Hyunjin; Rouabhia, Dounia; Zhang, Ze; Lavertu, Denis; Rouabhia, Mahmoud

Poster 19

The role of extracellular matrix in collagen biomineralization

Alexander Lausch, *University of Toronto*

Lausch, Alexander; Sone, Eli

Orthopaedic Biomaterials

Poster 20

Preliminary in vitro biological evaluation (cytocompatibility and degradation products) of vertebroplasty cement candidates

Victoria Dickinson, *Dalhousie University*

Dickinson, Victoria; Boyd, Daniel; Zhang, Xiao Fang

Poster 21

Predicting Composition-Property Relationships for Germanium-Based Glass Ionomer Cements: A Multifactor Central Composite Design Approach to Material Design

Lauren Kiri, *Dalhousie University*

Kiri, Lauren; Dickey, Brett; Boyd, Daniel

Poster 22

Novel Bioactive Borate Glasses for Biomedical Applications

Muhammad Sami Hasan, *Dalhousie University*

Hasan, Muhammad Sami; Boyd, Daniel

Characterization Methods

Poster 23

Characterization of Human Platelets by Raman Spectroscopy

Nicolas Lacroix, *University of Ottawa*

Lacroix, Nicolas; Omelon, Sidney; Variola, Fabio

Poster 24

Using Infrared and Raman Microspectroscopies to Compare Ex Vivo Involved Psoriatic Skin and Normal Human Skin

Marie Leroy, *Université Laval*

Leroy, Marie; Lefèvre, Thierry; Pouliot, Roxane; Auger, Michèle; Laroche, Gaétan

Poster 25

Withdrawn

Late-Breaking Posters

Poster 26

Does Collagen Crosslinking in Ageing and Diabetes Modulate Overload Damage to Tendon Collagen?

Adam Brown, *Dalhousie University*

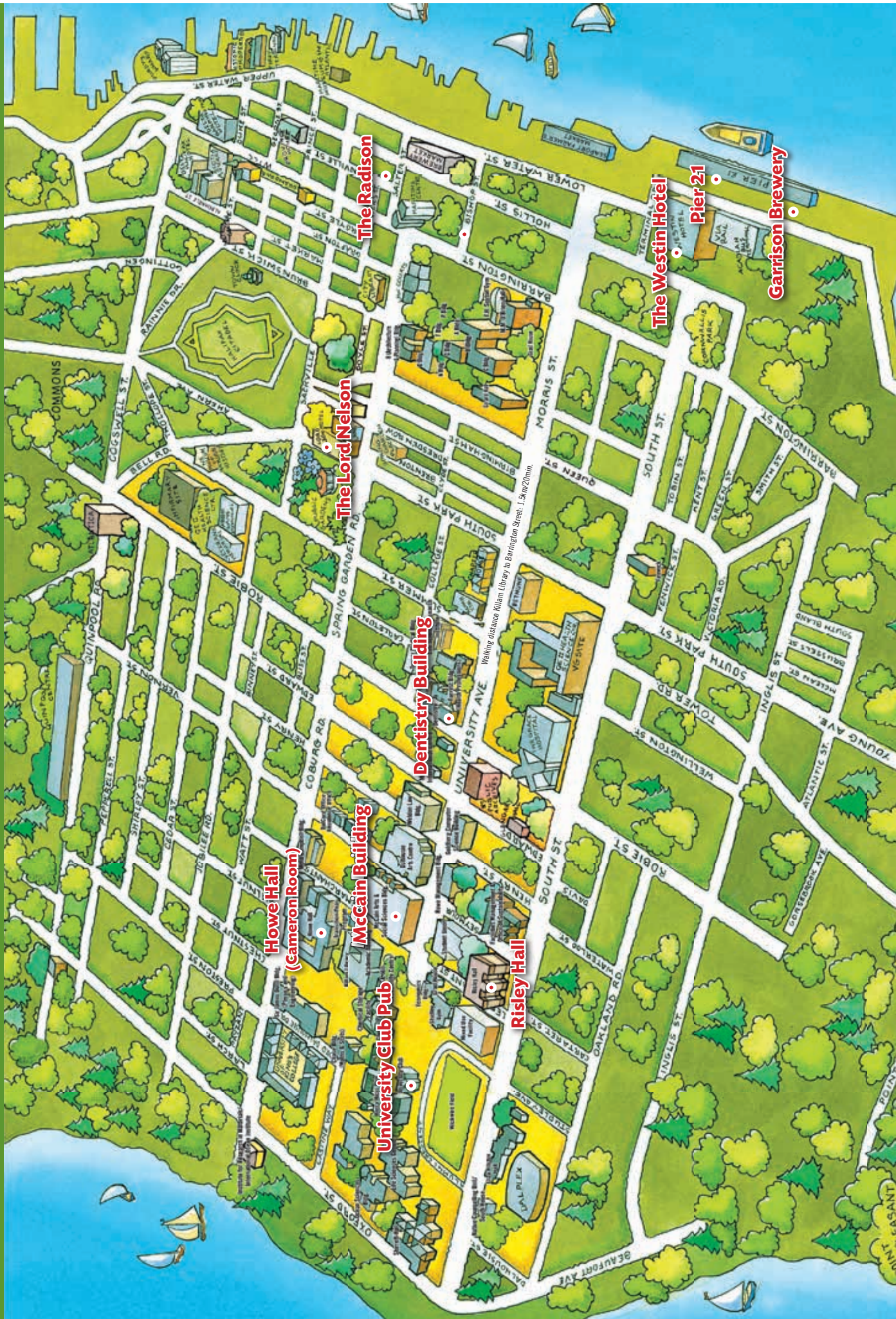
Brown, Adam; Veres, Samuel; Lee, J Michael

Poster 27

Calcium Polyphosphate Particulate Bone Void Fillers - Rabbit Model Study

Robert Pilliar, *University of Toronto*

Hu, Youxin; Grynpas, Marc; Theodoropoulos, John; Kandel, Rita; Pilliar, Robert





 **DALHOUSIE**
UNIVERSITY
Founded 1818