

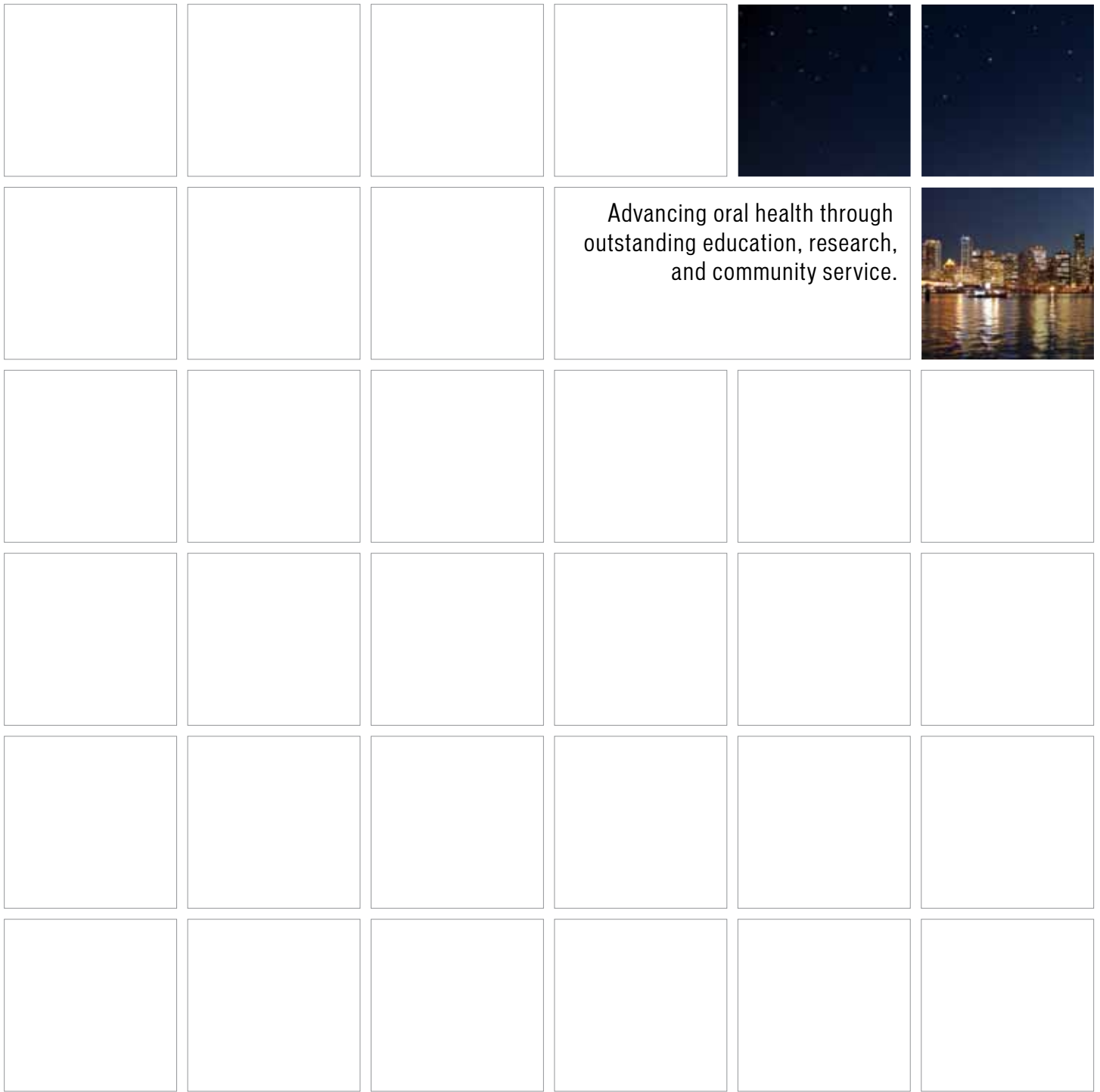
UBC DENTISTRY



Technological Advances in Dentistry:
Decision-Making in Clinical Use
JANUARY 22, 2013

RESEARCH DAY 2013





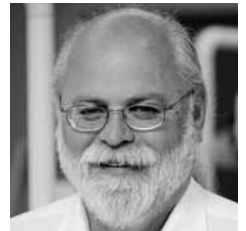
Advancing oral health through
outstanding education, research,
and community service.

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MESSAGE FROM THE DEAN

Welcome to the Sixth UBC Faculty of Dentistry Research Day.



All of the previous Research Days have been very successful and we are pleased to have an outstanding program for today. The 2013 Research Day continues the approach of using a clinical case to introduce the need to conduct basic research and the translation of research findings into patient care applications. Research is the investment that the profession makes for the future. Basic research findings will become new diagnostic and therapeutic approaches for our patients and so it is critical to keep pushing the envelope of knowledge forward. UBC is a research-intensive university and the Faculty of Dentistry is committed to playing a critical role in oral health research. We hope that this day highlights the links between basic research and clinical dentistry.

The overall theme for Research Day 2013 is Technological Advances in Dentistry. The rate of change in technology has increased at an incredible rate. Approaches that could not have even been imagined 25 years ago are now becoming common and in fact approaching the standard of care. At this time, many of the technological advances are quite expensive and decisions to invest need to be carefully considered. The clinical decision-making required to use a new technology needs to take the best interests of the patient into account. UBC Dentistry faculty members and the people working in their laboratories are at the cutting edge of both developing and implementing these technologies, which makes the speakers in today's program particularly valuable. They will

be resources for the dental profession in British Columbia for many years and understanding their programs of research should be very beneficial.

We are delighted to have a keynote speaker who is internationally recognized for his research in composite resins. Professor Jack Ferracane is from just down the coast in Oregon and we hope he will become a much more frequent visitor to Vancouver and the UBC Faculty of Dentistry. I have heard him speak on several occasions and always come away with new insights about composite resins.

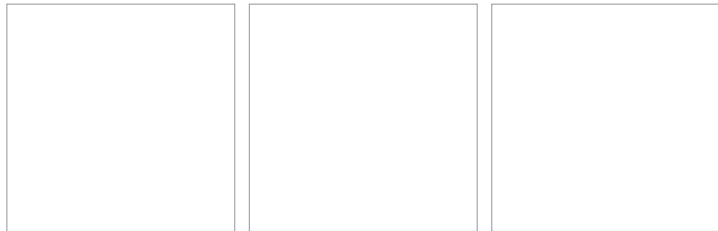
I hope you enjoy the program and gain additional awareness of the new technologies that are entering the practice of dentistry. I further hope you gain perspective on the considerations for using new technology on your patients and the clinical decision-making that is required. Future research technological advances are certain to make a difference in our approaches to diagnosis and treatment.

Thank you for your participation.

A handwritten signature in black ink that reads "Charles Shuler". The signature is fluid and cursive.

Charles F. Shuler, DMD, PhD
Professor and Dean, UBC Faculty of Dentistry

CRANIOFACIAL IMAGING CASE



A 15-year-old male patient with severe unilateral right cleft lip and palate was referred for orthodontic consultation to manage his skeletal and dental malocclusion. At the time of surgical treatment planning, the orthodontic diagnostic records revealed concerns regarding sinus abnormalities, potentially greater velopharyngeal insufficiency following maxillary surgical advancement, and a bony defect remaining at the cleft site. After consultation with the cleft palate team at BCCH, the recommendation was made to supplement his plain film records with a cone beam CT radiograph using the iCAT NG CBCT machine at the BCCH Dental Clinic. The patient and his parents were concerned about the necessity for further radiographic imaging and asked why the current plain film radiographs were inadequate. In addition, could steps be taken to reduce radiation exposure but still provide the required diagnostic information.

[Case courtesy of Dr. Dorothy Sonya]

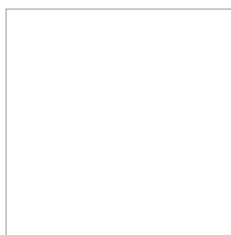
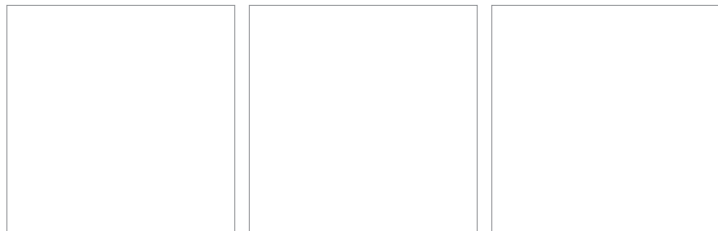
Case Learning Objectives

At the end of the day, participants are expected to be able to:

- Explain the relationship between radiation dose and image quality.
- Describe the concerns related to the use of radiographic imaging modalities in pediatric patients.
- Understand the differences in the radiation doses associated with 3D craniofacial imaging modalities.



RESTORATIVE DENTISTRY CASE



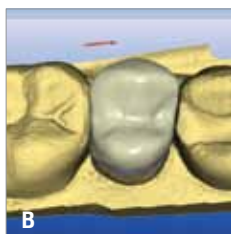
This patient presented to Faculty Practice with a fractured buccal cusp on tooth 15 (A). The fracture was well coronal to the gingival margin and adjacent to an existing wide MOD composite restoration. Treatment options that were presented included: (i) a very large composite MODB direct restoration; (ii) a metal ceramic crown; or (iii) a CEREC bonded ceramic onlay. The patient was interested in the last option as it was expected to have a better long-term prognosis than a large direct restoration, more tooth structure would be conserved, and an acceptable esthetic outcome could be achieved in one day. However, the patient did question whether the selection of milling material was important to consider and if the final restoration would fit as well as a restoration that was made using traditional impression techniques. The onlay was completed in one session (B) and cemented the same day (C).

[Case courtesy of Dr. Mark Fogelman]

Case Learning Objectives

At the end of the day, participants are expected to be able to:

- Explain the principles of CAD/CAM use in clinical dental practice.
- Discuss dental materials available for CAD/CAM milling and their selection criteria.
- Understand the marginal fit limitations achieved with CAD/CAM milling.
- Describe how changes in resin formulations continue to improve retention, wear resistance, and esthetics.



UBC Dentistry Research Day 2013

Technological Advances in Dentistry: Decision-Making in Clinical Use

Tuesday, January 22, 2013 · 8:00 am – 3:00 pm

UBC Student Union Building Ballroom

8:00 – 8:40

REGISTRATION & CONTINENTAL BREAKFAST

8:40 – 8:50

WELCOME

Dr. Charles Shuler, Professor and Dean

INTRODUCTION & OVERVIEW OF THE DAY

Dr. Edward Putnins, Professor and Associate Dean of Research, Graduate & Postgraduate Studies

8:50 – 9:15

IMAGE QUALITY AND DOSIMETRY IN CONE BEAM CT

Dr. Nancy Ford, Assistant Professor, Division of Oral Biology, Department of Oral Biological & Medical Sciences

“What are the compromises between image quality and radiation dose?”

9:20 – 9:40

USE OF CONE BEAM CT IN THE PEDIATRIC PATIENT

Dr. Ella Choi, MSc/Diploma in Pediatric Dentistry Student, Division of Pediatric Dentistry, Department of Oral Health Sciences

“What is the radiation dose in pediatric patients receiving cone beam CT imaging?”

9:45 – 10:10

A COMPARISON OF THE RADIATION DOSE FROM DIFFERENT DENTAL IMAGING PROCEDURES

Dr. Pierre Deman, Postdoctoral Research Fellow, Department of Oral Biological & Medical Sciences

“How do radiation doses in cone beam CT compare to other X-ray procedures?”

10:10 – 10:30

COFFEE BREAK

10:35 – 11:00

ANALOG TO DIGITAL: PARADIGM SHIFT IN RESTORATIVE DENTISTRY

Dr. Mark Fogelman, Clinical Assistant Professor, Department of Oral Health Sciences

“How can CAD/CAM dentistry benefit the practitioner and patient?”

11:05 – 11:30

DENTAL MATERIALS SELECTION FOR CAD/CAM SYSTEMS

Dr. N. Dorin Ruse, Professor and Chair, Division of Biomaterials, Department of Oral Biological & Medical Sciences

“What dental materials are available for CAD/CAM systems and what should be considered when making a choice?”

11:35 – 11:50

RESEARCH POSTER AWARDS PRESENTATION

Dr. Ravindra Shah, Associate Professor and Director, International Relations

Undergraduate & Graduate Students

11:50 – 1:00

LUNCH (BOX LUNCH PROVIDED) & RESEARCH POSTER VIEWING

Posters by undergraduate students, graduate students, postdoctoral fellows, research associates, visiting scientists, and faculty members

1:05 – 1:25

DIGITAL SCAN, DIGITAL DESIGN, DIGITALLY-CONTROLLED MILLING—A PARADIGM CHANGE IN PROSTHODONTICS

Dr. Jonathan Ng, MSc/Diploma in Prosthodontics Student, Division of Prosthodontics & Dental Geriatrics, Department of Oral Health Sciences

“What is the marginal fit accuracy of crowns fabricated using intraoral scanning, digital design, and 5-axis milling?”

1:30 – 2:45

RESIN COMPOSITES—STATE-OF-THE-ART (KEYNOTE ADDRESS)

Dr. Jack Ferracane, Department of Restorative Dentistry, Oregon Health & Science University, Portland, Oregon

“What formulation changes are being made to enhance properties and performance?”

2:45 – 3:00

CASE WRAP-UP & DISCUSSION

UBC Dentistry Thanks the Following Research Day Sponsors:

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MESSAGE FROM THE ASSOCIATE DEAN OF RESEARCH



Thank you for attending the Sixth Annual UBC Dentistry Research Day.

As novel technologies and materials are developed with the premise that they will enhance the standard of care and will be utilized in health care offices, it is crucial for professionals to not only embrace them with cautious optimism but to critically evaluate them in relation to patient safety and their relative improvement over established technologies/materials. Research Day 2013 aims to examine some key aspects associated with cone beam computed tomography, CAD/CAM technologies, dental material selection for CAD/CAM, and a review of state-of-the-art resin composites.

To begin the day, we will have three presentations from the laboratory of Dr. Nancy Ford focusing on cone beam CT. They will address the relationship between radiation dosimetry and image quality, the use of cone beam CT for pediatric patient assessment, and a comparison of this new imaging modality with traditional radiographic techniques. As the day progresses, we will transition to a review of CAD/CAM technologies and how digital imaging and milling is transforming crown preparation. Three presentations will cover the use of CAD/CAM machines in dental offices, aspects related to dental material selection for CAD/CAM, and the results of an assessment of marginal crown fit achieved via CAD/CAM. We are delighted and honoured to have Dr. Jack Ferracane, a world-class authority in

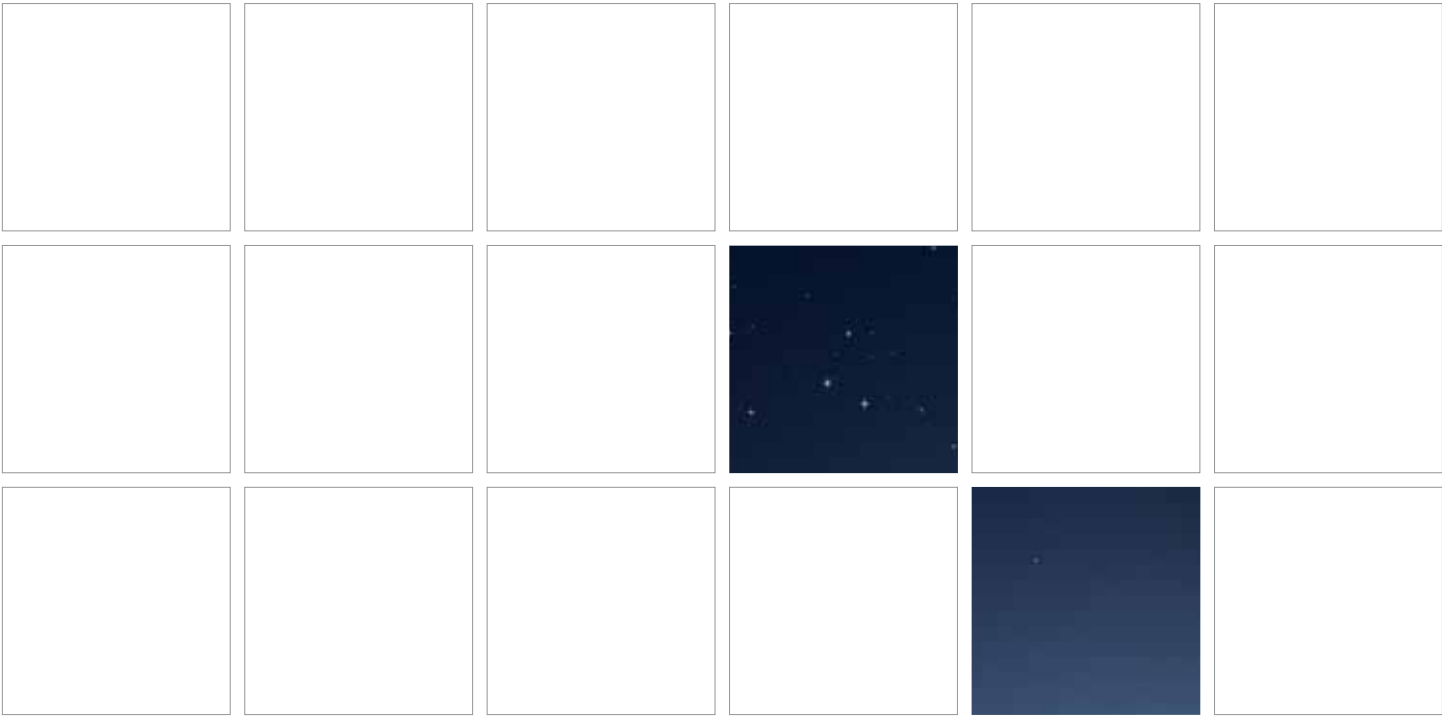
dental materials, present the keynote address on state-of-the-art dental resin composites. I would like to express our appreciation to the outstanding faculty, graduate students, postdoctoral research fellow, invited presenter, and our sponsors, all of whom have agreed to participate and support Research Day 2013.

In addition, please do read through this Research Day program booklet to see the other exciting research that is currently being done by our faculty and students here at the UBC Faculty of Dentistry. In closing, this Research Day and the book that you all have received were made possible by the efforts of many people on the Research Day Organizing Committee. I would like to personally thank Ingrid Ellis, Nancy Ford, Alison Kovacs, Jane Merling, Dorin Ruse, Nik Williams-Walsh, and Terry Wintonyk, who have worked very hard to ensure that all aspects of this day are successful.

Do enjoy Research Day 2013.



Edward E. Putnins, DMD, PhD, Dip Perio
*Professor and Associate Dean of Research,
Graduate & Postgraduate Studies*



NANCY FORD
ELLA CHOI
PIERRE DEMAN
MARK FOGELMAN
N. DORIN RUSE
JONATHAN NG
JACK FERRACANE





NANCY L. FORD, BSc, PhD
Dr. Nancy Ford completed her PhD in Medical Biophysics at the University of Western Ontario. Her initial academic appointment was in the Department of Physics at Ryerson University in Toronto, Ontario. Dr. Ford joined the University of British Columbia in 2011 as the Director of the Centre for High-Throughput Phenogenomics and an Assistant Professor in the Department Oral Biological & Medical Sciences. Her research has focused on optimizing and assessing imaging protocols for preclinical and clinical computed tomography.

IMAGE QUALITY AND DOSIMETRY IN CONE BEAM COMPUTED TOMOGRAPHY
 Advances in imaging technology have enabled affordable three-dimensional X-ray imaging techniques specifically targeting dental imaging. Cone beam computed tomography (CBCT) technology is available in dental offices worldwide and can produce 3D images of the maxillofacial region that were previously unattainable using 2D technologies. These images can be acquired with high spatial resolution to visualize the internal structures of the teeth and underlying bone. However, these high-quality 3D images come at a price—an increased radiation dose to the patient. In this presentation, the compromises between image quality and patient dose in CBCT will be discussed.



ELLA CHOI, BSc, DDS
Dr. Ella Choi is currently a second year student in the combined MSc and Diploma in Pediatric Dentistry Program at the UBC Faculty of Dentistry. She obtained her Doctor of Dental Surgery from the University of Alberta. Her research focuses on understanding the radiation dose in pediatric patients receiving cone beam CT imaging. She has received the Arthur Cumming Award for excellence in pediatric dentistry and the American Association of Pediatric Dentistry Student Award.

USE OF CONE BEAM COMPUTED TOMOGRAPHY IN THE PEDIATRIC PATIENT
 The frequency of use of cone beam computed tomography (CBCT) in dentistry is increasing every year. CBCT provides valuable information to dentists that cannot otherwise be obtained. However, there are a limited number of studies on CBCT radiation and its cumulative lifetime effect in children. Children are more sensitive to radiation and they have a longer post-radiation lifespan than adults: the younger the child, the higher their risk of cancer. The radiation dose from a single CT scan is relatively low. However, doses to pediatric patients are often higher than necessary. As part of my research, I have measured radiation doses using adult head phantoms and conducted population studies to determine the specifics for designing pediatric head phantoms.



PIERRE DEMAN, PhD

Dr. Pierre Deman performed life science imaging studies at the Institut Polytechnique du Grenoble (Diplôme D'Ingénieur, Grenoble, France) and the University of Grenoble (Master's Degree). He did his doctoral training at the Grenoble Neurosciences Institute and the European Synchrotron Radiation Facility on a new method of brain tumour radiation therapy and treatment follow-up with functional imaging (perfusion measurement). Dr. Deman completed a postdoctoral fellowship at the French Health Defense on lung immune system imaging using in vivo two-photon microscopy.

A COMPARISON OF THE RADIATION DOSE FROM DIFFERENT DENTAL IMAGING PROCEDURES

Dental cone beam computed tomography scanners were introduced to perform three-dimensional high resolution imaging. As they are dedicated to high contrast imaging, a low radiation dose to the patient is achievable. But there is currently no accepted method of confirming the dose as it is too different from narrow slice computed tomography and fluoroscopy, which have protocols to measure an indicator of the dose (CTDI and DAP, respectively). Dose distribution (dose free-in-air, in a phantom, beam profiles) and a new method compatible with every X-ray source has been tested and shows that the radiation received from a CBCT is two times lower than from a multi-slice CT and around 20 times higher than from a panoramic system.



MARK FOGELMAN, DMD, FCP

Dr. Mark Fogelman received his DMD degree from the Hebrew University in Jerusalem, Israel. He practiced general dentistry for 20 years prior to joining the University of British Columbia as a Clinical Assistant Professor. In 2008, he introduced the CEREC CAD/CAM dentistry program for undergraduate and graduate students. Soft tissue LED lasers were later integrated to add support to soft tissue management in the Integrated Clinical Care clinic. Dr. Fogelman's areas of special interest include incorporating technological advances in dental education and he is passionately involved in establishing a Digital Clinical Learning Centre at the UBC Faculty of Dentistry.

ANALOG TO DIGITAL: PARADIGM SHIFT IN RESTORATIVE DENTISTRY

Innovations in dental laboratory technology through the digitalization of manufacturing indirect restorations were the catalysts to the integration of emerging technologies in restorative dentistry. Change in dentistry is continuous and is traditionally evolutionary in nature. However, the rapidly developing field of technology is transforming dentistry at an unprecedented pace—more revolution than evolution. For many who are practicing and teaching dentistry, this is a paradigm shift that challenges many well-established practices. Consequently, we are required to make the right decisions for our patients, students, and the future of the dental profession. This presentation will review digital restorative technologies, some of them CAD/CAM, which are now available to dentists and which will continue to transform the practice of dentistry.



N. DORIN RUSE, MSc, PhD
Dr. Dorin Ruse received his MSc in Chemistry from the Babes-Bolyai University, Romania, and his PhD in Materials Science - Biomaterials from the University of Toronto. He was a Medical Research Council of Canada postdoctoral fellow at Queen Mary College, London, England and at the Centre for Biomaterials, Toronto. Since 1991, Dr. Ruse has done research and taught courses in Bio- and Dental Materials at the UBC Faculty of Dentistry. He has published and lectured extensively on dental materials topics.

DENTAL MATERIALS SELECTION FOR CAD/CAM SYSTEMS

This presentation will review dental materials currently used in CAD/CAM manufacturing of dental restorations and discuss advantages/disadvantages based on structure–property relationships. Experimental, high pressure/high temperature cured resin composite blocks intended for CAD/CAM applications will also be highlighted. Both *in vivo* and *in vitro* relevant published data, along with in-house research results regarding the life expectancy of currently available CAD/CAM materials, will be presented and discussed. The low temperature degradation of zirconia will be addressed. Finally, options, limitations, and application techniques for the attachment of CAD/CAM dental restorations to hard tooth tissue will be reviewed from a materials science point of view.



JONATHAN A. NG, BMSc, DDS
Dr. Jonathan Ng earned both his Bachelor of Medical Sciences (2005) and Doctor of Dental Surgery (2007) degrees from the University of Alberta. Following completion of a general practice residency, he maintained a staff position at the UA Hospital, treating medically compromised patients in a clinical and operating room environment. He also managed a rural practice in Elk Point, Alberta. Dr. Ng is currently in the final year of his graduate prosthodontic training at the University of British Columbia. He is very active in international aid missions and has a strong desire to help those in underdeveloped countries.

DIGITAL SCAN, DIGITAL DESIGN, DIGITALLY-CONTROLLED MILLING—A PARADIGM CHANGE IN PROSTHODONTICS

Conventional impression techniques using hydrocolloid and elastomeric materials have been used for decades and have been regarded by many as the standard of care. Techniques and procedures for the fabrication of a definitive prosthesis have also remained largely unchanged. The advent of new technologies has resulted in a push for more efficient, environmentally conscious, and cost-effective methods of dental prosthesis fabrication. The emergence of the digital impression has allowed for prosthesis design to remain entirely in the digital realm, thus eliminating physical intermediary steps or products. A fully digital workflow followed by a crown fabricated with 5-axis milling will be compared to the conventional method that has been practiced for generations.

KEYNOTE ADDRESS



JACK L. FERRACANE, PhD

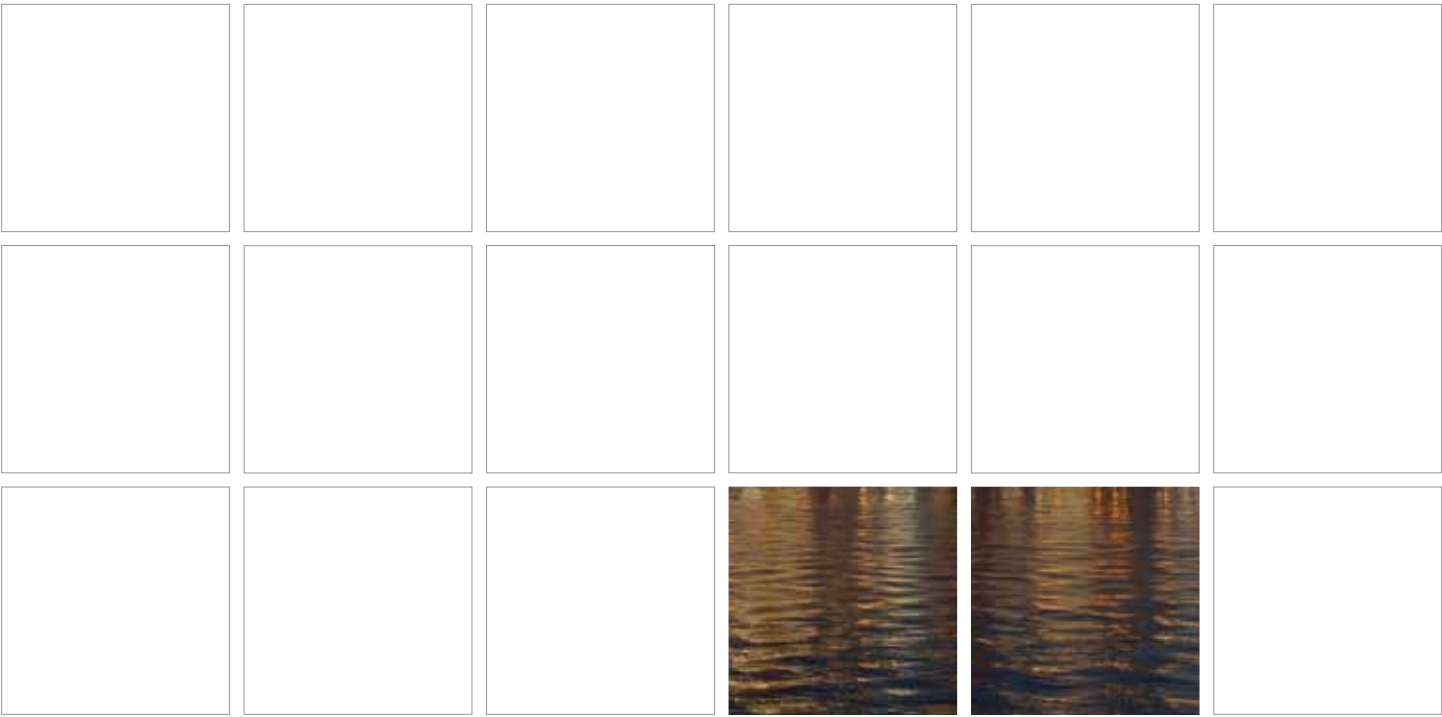
Dr. Jack Ferracane is Professor and Chair of Restorative Dentistry, and Division Director of Biomaterials & Biomechanics at the Oregon Health & Science University School of Dentistry. He has a BS in Biology from the University of Illinois, and an MS and PhD in Biological Materials from Northwestern University, Chicago, Illinois. Dr. Ferracane is a founding fellow and Past President of the Academy of Dental Materials. He is a Past President of the Dental Materials Group of the International Association for Dental Research. He serves on the editorial board of ten journals, and is currently an Associate Editor of the "Journal of Dental Research" and "Odontology." Dr. Ferracane has authored a textbook entitled "Materials in Dentistry: Principles and Applications," now in its second edition. He has published and lectured extensively on dental materials, including dental composites, adhesives, and dental amalgam.

Dr. Ferracane's current research interests are in dental composites and the use of bioactive glasses in resin-based dental materials. He also is actively involved in the establishment and operation of networks designed to conduct clinical research in the private practice setting. His research is funded by the NIH/NIDCR as well as private industry. Dr. Ferracane routinely presents at the IADR and the Academy of Dental Materials annual meetings. He has provided continuing education at annual meetings of the American Dental Association, British Dental Association, California Dental Association, Chicago Midwinter, Midwest Dental Conference, Oregon Dental Conference, Pacific Northwest Dental Conference, Southwest Dental Conference, Yankee Dental

Congress, Korean Academy of Pediatric Dentistry, and to other professional dental organizations.

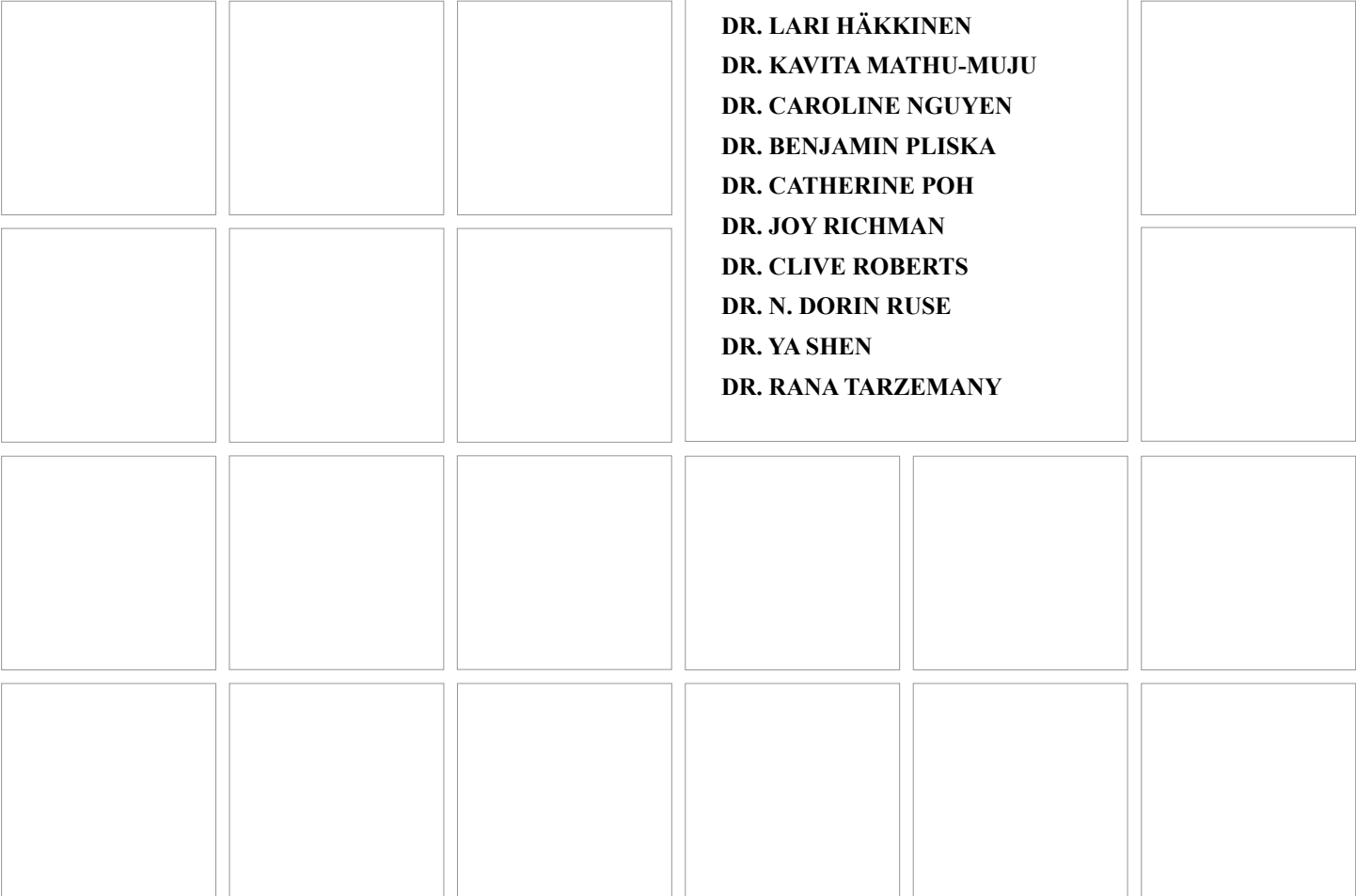
RESIN COMPOSITES— STATE-OF-THE-ART

The current state-of-the-art of dental composites includes a wide variety of materials with a broad range of mechanical properties, handling characteristics, and esthetic possibilities. There is no one ideal material available to the clinician, but the commercial materials that comprise the current armamentarium are of high quality and, when used appropriately, have proven to deliver excellent clinical outcomes of adequate longevity. This highly competitive market continues to evolve, with the major emphasis in the past being to produce materials with adequate mechanical properties, and high wear resistance and polish retention. The more recent research and development efforts have addressed the issue of polymerization shrinkage and its accompanying stress, which may have a deleterious effect on the composite-tooth interfacial bond. Current efforts are focused on the delivery of materials with self-adhesive properties, as well as those that can be placed in bulk, thus leading to truly simplified placement in the mouth. This presentation will review the current state of dental composites with an eye toward future developments and improvements.



POSTER ABSTRACTS
Poster Competition Judges

- DR. RAVINDRA SHAH (Chair)**
- DR. MAZEN ALOTAIBI**
- DR. DIETER BRÖMME**
- DR. S. ROSS BRYANT**
- DR. RICARDO CARVALHO**
- DR. LARI HÄKKINEN**
- DR. KAVITA MATHU-MUJU**
- DR. CAROLINE NGUYEN**
- DR. BENJAMIN PLISKA**
- DR. CATHERINE POH**
- DR. JOY RICHMAN**
- DR. CLIVE ROBERTS**
- DR. N. DORIN RUSE**
- DR. YA SHEN**
- DR. RANA TARZEMANY**



- 1 **Fibroblasts/Epithelial Cell Confrontations on Microgrooved Substrata**
Abdollahzadeh N*, Moon H, Brunette DM
Department of Oral Biological & Medical Sciences, Faculty of Dentistry, The University of British Columbia, Vancouver, Canada
- 2 **Micro-CT Measurement of the Internal Fit of Lithium Disilicate Crowns**
Alfaro D*¹, Wyatt C¹, Ruse D², Carvalho R³, Ng J¹
¹Division of Prosthodontics & Dental Geriatrics, Department of Oral Health Sciences, Faculty of Dentistry, The University of British Columbia, Vancouver, Canada (UBC); ²Division of Biomaterials, Department of Oral Biological & Medical Sciences, Faculty of Dentistry, UBC; ³Frontier Clinical Research Centre, Department of Oral Biological & Medical Sciences, Faculty of Dentistry, UBC
- 3 **eMax CAD vs eMax Press: a Fracture Mechanics Characterization**
Al-Kadi L*, Ruse ND
Department of Oral Biological & Medical Sciences, Faculty of Dentistry, The University of British Columbia, Vancouver, Canada
- 4 **The Role of Smad2 Overexpression and the Progression of Periodontitis**
Alotaibi M*, Kitase Y, Mills K, Shuler C
Department of Oral Biological & Medical Sciences, Faculty of Dentistry, The University of British Columbia, Vancouver, Canada
- 5 **Craniofacial Morphology and Sleep Disordered Breathing in Children**
Aran R*, Almeida F, Pliska B, Chen H, Lowe A
Department of Oral Health Sciences, Faculty of Dentistry, The University of British Columbia, Vancouver, Canada
- 6 **Bonding of FRC-Posts: Influence of Post Size**
Berthold C*^{1,2}, Mitterhuber B¹, Powers JM^{3,4}, Haapasalo M², Petschelt A¹
¹Dental Clinic I: Operative Dentistry & Periodontology, Friedrich-Alexander Universität Erlangen-Nürnberg, Germany; ²Department of Oral Biological & Medical Sciences, Faculty of Dentistry, The University of British Columbia, Vancouver, Canada; ³Restorative Dentistry & Prosthodontics, The University of Texas Health Science Center at Houston, Houston, Texas, USA; ⁴Dental Consultants, Inc., Ann Arbor, Michigan, USA
- 7 **In Vitro Retrieval Time Comparison of Three Endodontic Obturation Materials**
Braniste M*, Coil MJ, Shen Y, Haapasalo M
Department of Oral Biological & Medical Sciences, Faculty of Dentistry, The University of British Columbia, Vancouver, Canada
- 8 **Craniopagus Conjoined Twins: Challenges and Considerations for Dental Rehabilitation**
Campbell KM*, Johnston DH
Department of Oral Health Sciences, Faculty of Dentistry, The University of British Columbia and Department of Dentistry, BC Children's Hospital, Vancouver, Canada
- 9 **Effect of Fatigue on Nickel–Titanium Controlled Memory Instrument Torsional Failure**
Campbell L*¹, Shen Y¹, Zhou H², Haapasalo M¹
¹Division of Endodontics, Department of Oral Biological & Medical Sciences, Faculty of Dentistry, The University of British Columbia, Vancouver, Canada; ²Center for Biomedical Materials & Engineering, College of Material Science & Chemical Engineering, Harbin Engineering University, Harbin, China
- 10 **The Functional Effects on Mandibular Growth of Klearway™ versus Twin-Block**
Chen H*, Yagi K, Almeida F, Pliska B, Lowe A
Department of Oral Health Sciences, Faculty of Dentistry, The University of British Columbia, Vancouver, Canada

11 Neural Crest and Stemness Gene Expression by Human Gingival Fibroblasts
Cheung G*¹, Fournier B^{1,2}, Jiang G¹, Larjava H¹, Häkkinen L¹
¹Department of Oral Biological & Medical Sciences, Faculty of Dentistry, The University of British Columbia, Vancouver, Canada; ²Cordeliers Research Center, Descartes University, Paris, France

12 Soft and Hard Tissue Changes After Correction of Jaw Malocclusion
Chou BK*¹, Liew XL², Kao CT²
¹Faculty of Dentistry, The University of British Columbia, Vancouver, Canada; ²Orthodontic Department, College of Dentistry, Chung Shan Medical University, Taichung, Taiwan

13 Nickel–Titanium Rotary Instruments After Graduate Endodontic Clinical Use
Shen Y¹, Coil JM¹, Coil AJ*¹, Zhou H², Haapasalo M¹
¹Division of Endodontics, Department of Oral Biological & Medical Sciences, Faculty of Dentistry, The University of British Columbia, Vancouver, Canada; ²Center for Biomedical Materials & Engineering, College of Material Science & Chemical Engineering, Harbin Engineering University, Harbin, China

14 Effects of Endodontic Irrigation Solutions After Instrumentation with WaveOne
Crisanti M*, Shen Y, Haapasalo M
Division of Endodontics, Department of Oral Biological & Medical Sciences, Faculty of Dentistry, The University of British Columbia, Vancouver, Canada

15 The Effect of Agitation on Sodium Hypochlorite Penetration into Dentin
Davis S*, Shen Y, Haapasalo M
Division of Endodontics, Department of Oral Biological & Medical Sciences, Faculty of Dentistry, The University of British Columbia, Vancouver, Canada

16 Dental Cone Beam: What Dose for the Patient?
Deman P*¹, Thakur Y², Ford NL¹
¹Department of Oral Biological & Medical Sciences, Centre for High-Throughput Phenogenomics, Faculty of Dentistry, The University of British Columbia, Vancouver, Canada; ²Department of Radiology, Vancouver General Hospital, Vancouver, Canada

17 Deprived Oral Health Status Among Low-Incomes in Vancouver's Downtown Eastside
Hau K*^{1,2}, Ng S^{2,3}, Littlejohn D³, Poh C^{1,2,3}
¹Cancer Control Research, BC Cancer Agency/Research Centre, Vancouver, Canada; ²Department of Oral Biological & Medical Sciences, Faculty of Dentistry, The University of British Columbia, Vancouver, Canada; ³Vancouver Hospital & Health Science Centre, Vancouver Coastal Health Authority, Vancouver, Canada

18 Effectiveness of Bonding Agents Used at the UBC Dentistry Clinics
Hieawy AT*¹, Wang ZJ¹, Fogelman M², Carvalho RM^{1,3}, Manso AP¹
¹Department of Oral Biological & Medical Sciences, Faculty of Dentistry, The University of British Columbia, Vancouver, Canada (UBC); ²Department of Oral Health Sciences, Faculty of Dentistry, UBC; ³Frontier Clinical Research Centre, Faculty of Dentistry, UBC

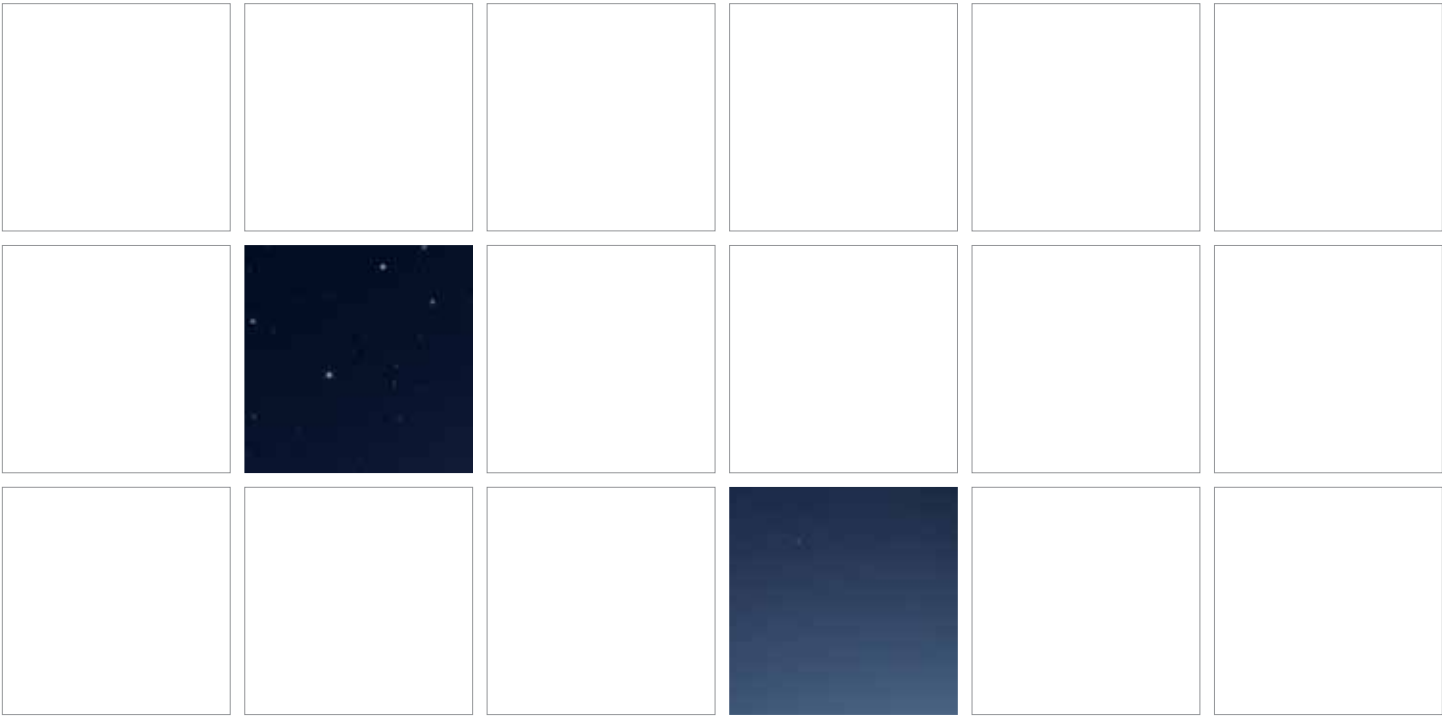
19 Experimental Perturbation of Tooth Regeneration in a Polyphyodont Lizard
Holmes SN*, Richman JM
Department of Oral Health Sciences, Faculty of Dentistry, Life Sciences Institute, The University of British Columbia, Vancouver, Canada

20 Wnt5a Induces Enzymatic Degradation of Craniofacial Cartilage via JNK Signalling
Hosseini-Farahabadi S*, Geetha-Loganathan P, Fu K, Richman JM
Department of Oral Health Sciences, Faculty of Dentistry, Life Sciences Institute, The University of British Columbia, Vancouver, Canada

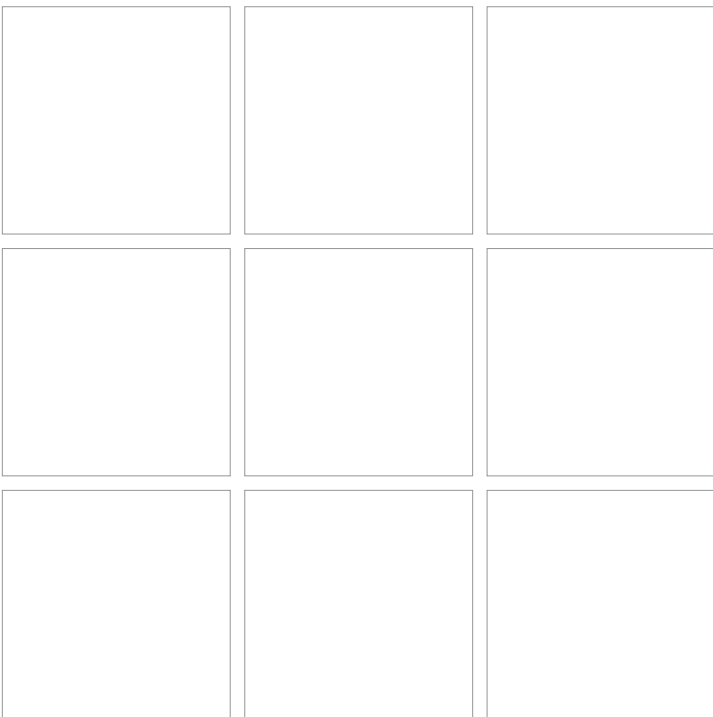
- 21 **Exosite Inhibitors of Cathepsin K as Collagenase Blockers to Treat Osteoporosis**
Hsu A*¹, Du X^{1,2}, Panwar P¹, Brömme D^{1,2}
¹Department of Oral Biological & Medical Sciences, Faculty of Dentistry, The University of British Columbia, Vancouver, Canada (UBC); ²Department of Biochemistry & Molecular Biology, Faculty of Medicine, UBC
- 22 **Orthodontic Treatment Needs of Aboriginal Adolescents in Haida Gwaii, Canada**
Karim A*, Aleksejūnienė J, Yen EHK
Department of Oral Health Sciences, Faculty of Dentistry, The University of British Columbia, Vancouver, Canada
- 23 **Transplantation of Neonatal Porcine Islets Encapsulated in 5% Alginate Beads**
Kiang RL*^{1,2}, Mojibian M³, Lo BK², Charman E², Hoesli CA², Hu X³, Johnson JD³, Kieffer TJ³, Piret JM²
¹Faculty of Dentistry, The University of British Columbia, Vancouver, Canada (UBC); ²Michael Smith Laboratories and Department of Chemical & Biological Engineering, UBC; ³Department of Cellular & Physiological Sciences and Department of Surgery, UBC
- 24 **Regulation of Macrophage Phenotype by Galectin-3**
Kianoush F*, Nematollahi M, Waterfield JD, Brunette DM
Department of Oral Biological & Medical Sciences, Faculty of Dentistry, The University of British Columbia, Vancouver, Canada
- 25 **Primer Design to Investigate Surface Topographic Effects on Gene Expression**
Kim MR*, Wong ATT, Brunette DM
Department of Oral Biological & Medical Sciences, Faculty of Dentistry, The University of British Columbia, Vancouver, Canada
- 26 **Microsensor Technology to Monitor Compliance with Removable Oral Appliances**
Kirshenblatt SJ*, Chen H, Lowe A, Pliska B, Almeida F
Department of Oral Health Sciences, Faculty of Dentistry, The University of British Columbia, Vancouver, Canada
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Kitase Y*, Shuler C
Department of Oral Biological & Medical Sciences, Faculty of Dentistry, The University of British Columbia, Vancouver, Canada
- 28 **Expression of Progressive Ankylosis Protein in $\alpha\beta 6$ Integrin-Deficient Ameloblasts**
Leung K*, Mohazab L, Koivisto L, Jiang G, Häkkinen L, Larjava H
Department of Oral Biological & Medical Sciences, Faculty of Dentistry, The University of British Columbia, Vancouver, Canada
- 29 **Screening Log in a Pan-Canadian Multi-Centre Study: the COOLS Trial**
Liu YK*¹, Duan S¹, Kami A¹, Lam S¹, Poh CF^{1,2}
¹BC Cancer Research Centre, Vancouver, Canada; ²Department of Oral Biological & Medical Sciences, Faculty of Dentistry, The University of British Columbia, Vancouver, Canada
- 30 **Oral Squamous Cell Carcinoma in Non-Smokers**
Lubpairee T*^{1,2}, Poh CF^{1,2}, Rosin MP¹, Zhang L^{1,2}
¹BC Oral Cancer Prevention Program, British Columbia Cancer Agency, Vancouver, Canada; ²Department of Oral Biological & Medical Sciences, Faculty of Dentistry, The University of British Columbia, Vancouver, Canada

- 31 **The Human Soft Palate Forms by Fusion, Not by Merging**
Mattson MN*, Diewert VM, Richman JM
Department of Oral Health Sciences, Faculty of Dentistry, The University of British Columbia, Vancouver, Canada
- 32 **Placement/Replacement of Direct Restorations at the UBC Dental Clinic**
Mok E*, von Bergmann H, Welburn N, Carvalho RM, Manso A
Faculty of Dentistry, The University of British Columbia, Vancouver, Canada
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Nam H*, Mathu-Muju KR
Department of Oral Health Sciences, Faculty of Dentistry, The University of British Columbia, Vancouver, Canada
- 34 **Multi-Component Caries Management Strategy for High-Risk Immigrant Children**
Ng C*¹, Campbell K¹, Harrison R¹, Glassby P²
¹Department of Oral Health Sciences, Faculty of Dentistry, The University of British Columbia, Vancouver, Canada; ²Vancouver Coastal Health Authority, Vancouver, Canada
- 35 **Marginal Fit Accuracy of Crowns Fabricated from Fully Digital Techniques**
Ng JA*¹, Wyatt C¹, Ruse D², Nguyen C¹, Fastlicht S¹, Alfaro D¹
¹Department of Oral Health Sciences, Faculty of Dentistry, The University of British Columbia, Vancouver, Canada (UBC); ²Department of Oral Biological & Medical Sciences, Faculty of Dentistry, UBC
- 36 **Strategic Planning for Collaborative Research and Education in Vietnam**
Saini R*, Zed C, Poh CF, Williams M
Department of Oral Biological & Medical Sciences, Faculty of Dentistry, The University of British Columbia, Vancouver, Canada
- 37 **Access to Dental Care for Adults with Developmental Disabilities**
Salmasi A*¹, Harrison R¹, Rush J²
¹Department of Oral Health Sciences, Faculty of Dentistry, The University of British Columbia, Vancouver, Canada (UBC); ²Faculty of Law, UBC
- 38 **The Effect of Commonly Prescribed Medications on Dry Mouth**
Sarai JK*¹, Nguyen CT¹, MacEntee MI¹, Mintzes B², Perry T²
¹Department of Oral Health Sciences, Faculty of Dentistry, The University of British Columbia, Vancouver, Canada (UBC); ²Department of Anesthesiology, Pharmacology & Therapeutics, Faculty of Medicine, UBC
- 39 **Retrospective Analysis of Dental Emergencies Managed at BC Children's Hospital**
Shih J*, Campbell K
Department of Oral Health Sciences, Faculty of Dentistry, The University of British Columbia, Vancouver, Canada
- 40 **Oral Health-Related Lifestyle of Vancouver Inner-City Elementary School-Aged Children**
Shojaei A*¹, Aleksejūnienė J¹, Gardner K¹, Saewyc E², Salimipour N¹
¹Department of Oral Health Sciences, Faculty of Dentistry, The University of British Columbia, Vancouver, Canada (UBC); ²School of Nursing, UBC
- 41 **Environmental Factors Affect the Susceptibility of Biofilm Bacteria to Disinfection**
Stojicic S*, Shen Y, Haapasalo M
Department of Oral Biological & Medical Sciences, Faculty of Dentistry, The University of British Columbia, Vancouver, Canada

- 42 **Role of Connexins in Regulating Fibroblast Function in Wound Healing**
Tarzemanly R*, Mah W, Jiang G, Larjava H, Häkkinen L
Department of Oral Biological & Medical Sciences, Faculty of Dentistry, The University of British Columbia, Vancouver, Canada
- 43 **Flexural Strength/Modulus and Fracture Toughness of Lava Ultimate Versus eMax CAD**
Thornton I*, Ruse ND
Department of Oral Biological & Medical Sciences, Faculty of Dentistry, The University of British Columbia, Vancouver, Canada
- 44 **Dual-Stiffness Silicone Culture Substrate Model Mechanical Properties of Fibrotic Microenvironments**
Tsai M*¹, Balestrini JL², Koch S², Hinz B²
¹Faculty of Dentistry, The University of British Columbia, Vancouver, Canada; ²Laboratory of Tissue Repair & Regeneration, Matrix Dynamics Group, Faculty of Dentistry, The University of Toronto, Toronto, Canada
- 45 **Dental Care Access for Children with Special Health Care Needs**
Vertel N*¹, Harrison R¹, Campbell K^{1,2}
¹Department of Oral Health Sciences, Faculty of Dentistry, The University of British Columbia, Vancouver, Canada; ²Department of Dentistry, BC Children's Hospital, Vancouver, Canada
- 46 **Effect of pH on Microhardness and Microstructure of Root Repair Materials**
Wang Z*, Shen Y, Haapasalo M
Division of Endodontics, Department of Oral Biological & Medical Sciences, Faculty of Dentistry, The University of British Columbia, Vancouver, Canada
- 47 **Gene Expression of RAW264.7 Macrophages Grown on Implant Surfaces**
Wong ATT*, Kim MR, Barth K, Kappelhoff R, Waterfield JD, Brunette DM
Department of Oral Biological & Medical Sciences, Faculty of Dentistry, The University of British Columbia, Vancouver, Canada
- 48 **Evaluating Normal Growth of Facial Prominences with Optical Projection Tomography**
Woo JW*¹, Ford N², Richman JM¹
¹Department of Oral Health Sciences, Faculty of Dentistry, Life Sciences Institute, The University of British Columbia, Vancouver, Canada (UBC); ²Department of Oral Biological & Medical Sciences, Centre for High-Throughput Phenogenomics, Faculty of Dentistry, UBC
- 49 **Surface Preparation Effect on Bonding to eMax CAD: a Fracture Mechanics Study**
Zaeimdar F*, Ruse ND
Department of Oral Biological & Medical Sciences, Faculty of Dentistry, The University of British Columbia, Vancouver, Canada
- 50 **Patient and Appliance Factors Affecting Survival of Fixed Space-Maintaining Appliances**
Zhao MH*¹, Campbell K¹, Harrison RL¹, Kennedy DB¹, Koroluk L²
¹Department of Oral Health Sciences, Faculty of Dentistry, The University of British Columbia, Vancouver, Canada; ²Division of Orthodontics, School of Dentistry, The University of North Carolina at Chapel Hill, Chapel Hill, North Carolina, USA



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- COMMUNITY & EDUCATIONAL RESEARCH CLUSTER
- iMATRIX RESEARCH CLUSTER

CLINICAL RESEARCH, TECHNOLOGY TRANSFER & DENTAL MATERIALS SCIENCES RESEARCH CLUSTER

This cluster encompasses groups engaged in research on cancer diagnosis and prevention, dental biofilms, dental hygiene, dental instruments and materials, dental sleep medicine, forensic dentistry, and interactive dental anatomy. Our areas of expertise include biomaterials, dental morphology, obstructive sleep apnea, oral cancer, and root canal irrigation. We study matters such as bacterial eradication, cellular interactions, cephalometrics, community outreach programs, computational fluid dynamics, diagnostic tools, DNA analysis, fracture mechanisms, molecular markers, novel disinfection strategies, oral care products, surface characterization, and treatment strategies.

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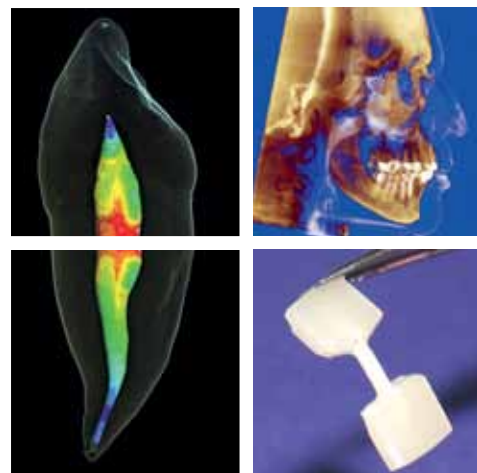
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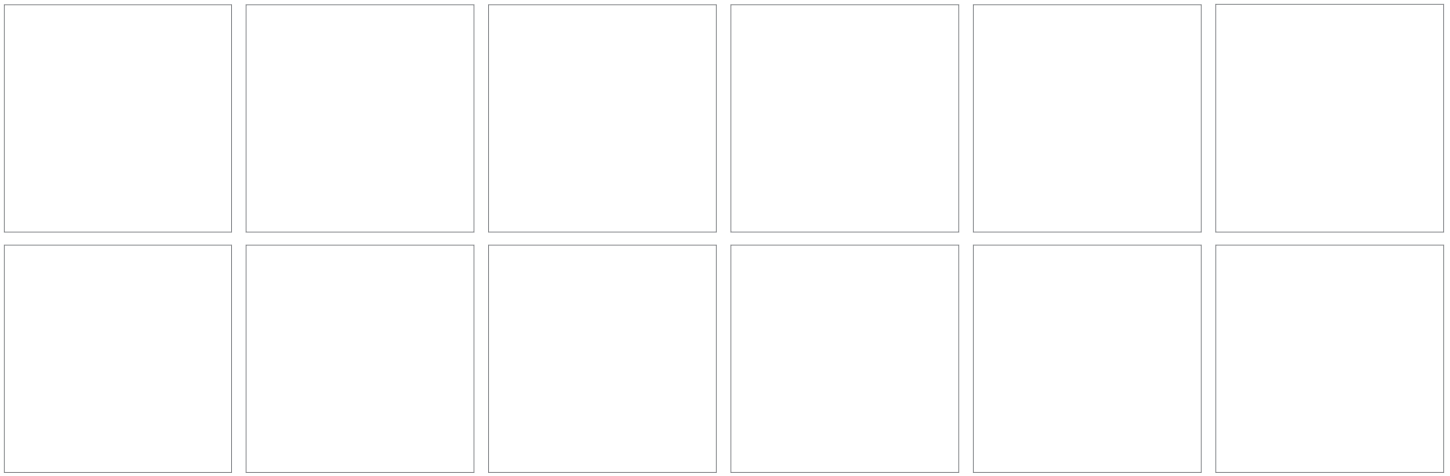
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COMMUNITY & EDUCATIONAL RESEARCH CLUSTER

The research in this cluster relates to three of the four Canadian Institutes of Health Research themes: health services research; social, cultural, environmental, and population health; and clinical research—and to a range of educational studies. These domains are loosely interconnected and employ various quantitative and qualitative research methods and knowledge transfer. Our members conduct studies on diverse topics such as healthcare promotion, oral implants, dental caries, systematic literature reviews, and community service learning.

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iMATRIX RESEARCH CLUSTER

iMatrix is an interactive research cluster combining the research interests of 12 highly active laboratories in oral and biomedical sciences. We conduct basic science research in areas such as cancer, cell behaviour, craniofacial development, integrins, molecular biology, periodontal disease, proteases, proteomics, and wound healing. Highly motivated undergraduate and graduate students, postdoctoral fellows and other trainees, as well as interested collaborators, are welcome to contact our member laboratories.

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CHRISTOPHER OVERALL

Proteomic investigation of inflamed periodontal and synovial tissues and cancer to elucidate proteolytic mechanisms of cell signalling and in regulating inflammation

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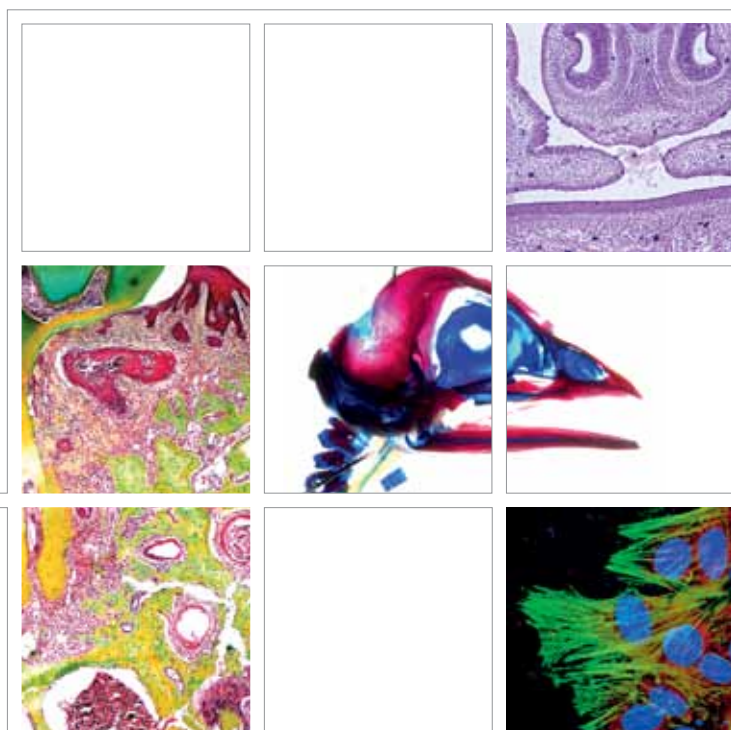
Synthesis and degradation of proteoglycans in the cell biology of wound healing

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For more information on graduate programs visit www.dentistry.ubc.ca/grad or contact: Vicki Koulouris vkoulouris@dentistry.ubc.ca T 604 822 4486

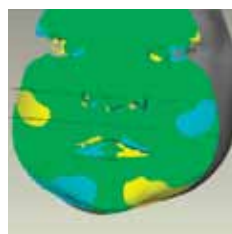
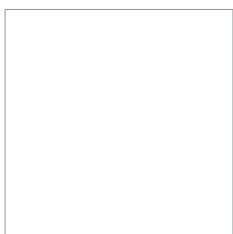
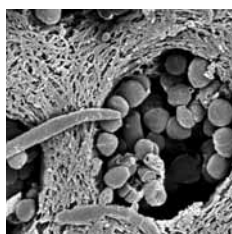
GRADUATE RESEARCH OPPORTUNITIES

PhD or MSc in Craniofacial Science

The UBC Faculty of Dentistry offers advanced study leading to a PhD or MSc in Craniofacial Science. The PhD program requires the successful completion of a research-specific curriculum, a comprehensive exam, and defense of a research-based thesis. A minimum of four years of full-time study is typically required. The MSc program requires successful completion of a research-specific didactic curriculum in conjunction with a research-based thesis. This program typically requires two years of full-time study; however, an extended part-time option for an MSc degree is available. Research options in one of the following three broad areas of study are available:

- Population health research explores the complex interactions (social, cultural, environmental) that affect the oral health of individuals, communities, and populations.
- Oral health-related clinical research includes both interventional and observational studies focusing on the following: disease prevention, diagnosis, risk, treatment, prognosis, and health care.
- Basic science research in the areas of biomaterials, cell biology, developmental biology, microbiology, and molecular biology.

These graduate programs are available as stand-alone degrees or may be completed as a combined diploma in a clinical specialty with a PhD or MSc degree (see criteria below). Clinical specialty training options are available in the following areas.



Endodontics

PhD or MSc combined with a Diploma in Endodontics

- PhD degree (minimum 6 years) or MSc degree (minimum 3 years)
- Diploma in Endodontics

Graduates will be eligible to take the examinations for specialty certification in endodontics offered by the Royal College of Dentists of Canada and the American Board of Endodontics.

Research Focus

- eradication of microorganisms from the root canal system
- development of unique *in vitro* and *ex vivo* models for biofilms which simulate oral *in vivo* biofilms
- industry collaborations on new devices to improve antimicrobial solutions
- safety and effectiveness of instrument systems to deliver disinfecting agents into the root canal
- impact of file design on the eradication of root canal microbes

Clinical Training

- treatment management (including surgery) of diseases and trauma of the tooth root and pulp

Criteria

- Applicants must hold a DMD or its equivalent
- Application deadline: August 1

Orthodontics

PhD or MSc combined with a Diploma in Orthodontics

- PhD degree (minimum 6 years) or MSc degree (minimum 3 years)
- Diploma in Orthodontics

Graduates will be eligible to take the examinations for specialty certification in orthodontics offered by the Royal College of Dentists of Canada and the American Board of Orthodontics.

Research Focus

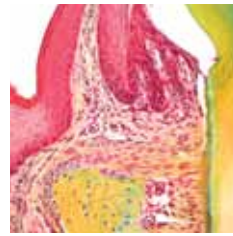
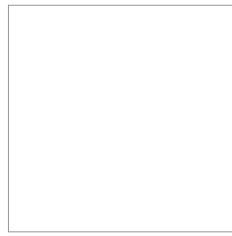
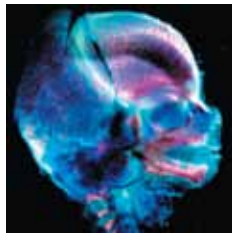
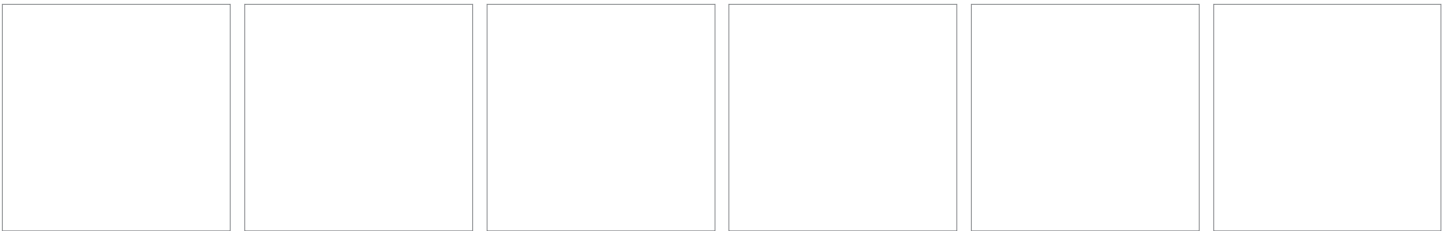
- craniofacial morphology and function in different populations
- efficiency and efficacy of treatment modalities
- societal and economic strategies that govern access to care
- craniofacial molecular and cellular control mechanisms
- impact of biomaterials on delivering orthodontic mechanics

Clinical Training

- diagnosis, prevention and treatment management of abnormal congenital or developmental relationships of the dentofacial anatomy from infancy to adulthood in diverse populations

Criteria

- Applicants must hold a DMD or its equivalent
- Postgraduate clinical and/or academic experience preferred
- Application deadline: September 1



Pediatric Dentistry

PhD or MSc combined with a Diploma in Pediatric Dentistry

- PhD degree (minimum 6 years) or MSc degree (minimum 3 years)
- Diploma in Pediatric Dentistry

Graduates will be eligible to take the examination for specialty certification in pediatric dentistry offered by the Royal College of Dentists of Canada and the diplomate examination of the American Board of Pediatric Dentistry.

Research Focus

- biomedical research (craniofacial development)
- clinical research (facial symmetry of cleft lip and palate)
- population health and health services research (oral health promotion and access to care for disadvantaged children)

Clinical Training

- diagnostic, preventive, therapeutic and consultative expertise for children and adolescents including those with special healthcare needs at BC Children’s Hospital Dental Department, Oral Health Centre at UBC Vancouver, and community settings throughout the province

Criteria

- Applicants must hold a DMD or its equivalent
- Application deadline: October 1

Periodontics

PhD or MSc combined with a Diploma in Periodontics

- PhD degree (minimum 6 years) or MSc degree (minimum 3 years)
- Diploma in Periodontics

This program is recognized by the American Dental Association and the Academy of Periodontology. Graduates will be eligible to take the examination for fellowship in the Royal College of Dentists of Canada and the board examination of the American Academy of Periodontology.

Research Focus

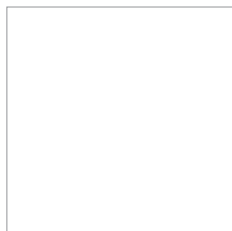
- molecular pathology of periodontal disease
- periodontal and skin wound healing
- clinical aspects of tissue healing around implants
- stem cell-mediated regeneration of lost tissues

Clinical Training

- management of tooth-supporting structures using non-surgical and surgical procedures
- tooth replacement with implants when needed

Criteria

- Applicants must hold a DMD or its equivalent
- Application deadline: September 1



Prosthodontics

PhD or MSc combined with a Diploma in Prosthodontics

- PhD degree (minimum 6 years) or MSc degree (minimum 3 years)
- Diploma in Prosthodontics

Graduates will be eligible to take the examinations for specialty certification in prosthodontics offered by the Royal College of Dentists of Canada and the American Board of Prosthodontics.

Research Focus

- geriatric dentistry
- oral implants and related prostheses
- caries management
- psychosocial aspects of aging
- community healthcare needs

Clinical Training

- diagnosis, restoration and maintenance of oral function, comfort, appearance and health of patients by the restoration of natural teeth and/or the replacement of missing teeth and contiguous oral and maxillofacial tissues with artificial substitutes
- aesthetics/cosmetic dentistry
- crowns, bridges, veneers, inlays
- complete and removable partial dentures
- dental implants
- TMD-jaw joint problems
- traumatic injuries to the structures of the mouth

Criteria

- Applicants must hold a DMD or its equivalent
- Application deadline: October 1

For more information on postgraduate programs visit www.dentistry.ubc.ca/postgrad or contact: Dorothy Stanfield dstanf@dentistry.ubc.ca T 604 822 0345

POSTGRADUATE OPPORTUNITIES



General Practice Residency Program

- Advanced postgraduate training in dental specialties in a hospital setting
- Approximately 11 salaried, residency positions per year (one- or two-year)

Applicants choose to apply to the Pediatric Residency, Geriatric Dentistry Residency, or the General Practice Residency. All programs are approved by the Commission on Dental Accreditation of Canada.

A variety of local, provincial and international learning opportunities are available to expand the comprehensive training each resident receives. Community clinics provide oral healthcare to individuals on income assistance, job training and other pre-employment programs. Care to the people of Haida Gwaii supports a community dental health strategy. International experience broadens the scope of learning to understand regional disease processes, treatment modalities and cultural competencies.

Local-Based Residencies

- BC Cancer Agency, BC Children's Hospital, Vancouver Hospital & Health Sciences Centre, St. Paul's Hospital, Portland Community Clinic, First United Oral Health Program, Vancouver Native Health Society (and other community clinics)

Provincial-Based Residencies

- Haida Gwaii (Skidegate and Massett dental clinics), Kelowna Gospel Mission, Prince George Native Friendship Centre, Victoria (Cool Aid Community Health Centre)

International-Based Residencies

- Vietnam (University of Ho Chi Minh, National Hospital of Odonto-Stomatology and Ho Chi Minh City Cancer Centre)
- Cambodia (Angkor Hospital for Children, Siem Reap)
- United Kingdom (Solihull, Queen Elizabeth and Birmingham Children's Hospitals)

Application deadline: October 15

Oral Medicine and Oral Pathology Residency Program

- Hospital-based postgraduate specialist residency
- Three pathways: Oral Medicine (OM, three years), Oral Pathology (OP, three years), or Combined (OMOP, four years)

Completion of any of the three pathways leads to a certificate and eligibility for the Royal College of Dentists of Canada fellowship examinations.

Local hospital-based training sites

- UBC-affiliated teaching hospitals: BC Cancer Agency, Vancouver Hospital & Health Sciences Centre, St. Paul's Hospital

Clinical practice component (training diagnosis, assessment and management)

- oral mucosal disease
- orofacial disorders associated with aging, systemic disease and medical therapies
- non-surgical salivary gland disorders
- rotations in anesthesia, internal medicine, rheumatology, neurosciences, dermatology, diagnostic pathology, oncology, otolaryngology, surgical pathology (including autopsy), head and neck pathology, and dermatopathology
- OM pathway: additional training in dental management of medically complex patients and diagnosis and treatment of orofacial pain and neurosensory disorders
- OP pathway: additional training in surgical and anatomical histopathology and laboratory procedures, techniques and diagnosis

Didactic component

- postgraduate-level seminars, case presentations and literature reviews
- teaching rounds
- ongoing basic and/or clinical research studies

Application deadline: November 1

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† M. Kern et al. "Ten-year results of three-unit bridges made of monolithic lithium disilicate ceramic"; Journal of the American Dental Association; March 2012; 143(3):234-240.
 †† Mean observation period 4 years IPS e.max Press, 2.5 years IPS e.max CAD.
 See The IPS e.max Scientific Report Vol. 1 (2001-2011).





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* The IPS e.max Scientific Report Vol. 01 (2001 - 2011) is now available at: www.ivoclarvivadent.us/emax/science

CONGRATULATIONS UBC DENTISTRY

The British Columbia Dental Association (BCDA) congratulates UBC Dentistry on its Research Day which highlights the faculty's research accomplishments.



Supporting oral radiology in British Columbia, the **BCDA's Mandatory X-Ray Inspection Program** provides X-ray inspections to our members across the province. Developed in conjunction with WorkSafeBC & the BC Centre for Disease Control, the program ensures our members' compliance with the requirements of Health Canada's *Safety Code 30*. Inspections of cone beam computed tomography (CBCT) units are also offered at a cost of \$560 plus HST.

Questions?

Visit bcdental.org for more information or contact the BCDA at 604 736 7202 or bcda@bcdental.org.

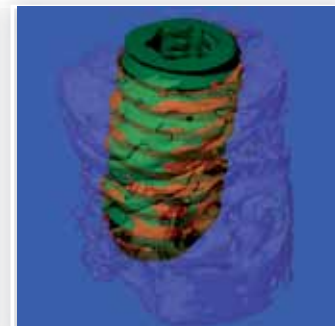
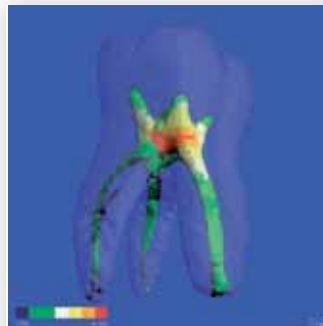
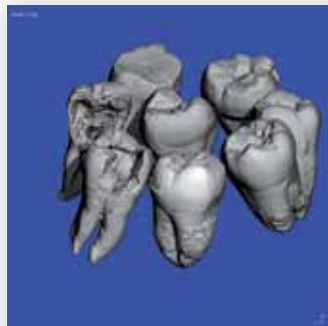
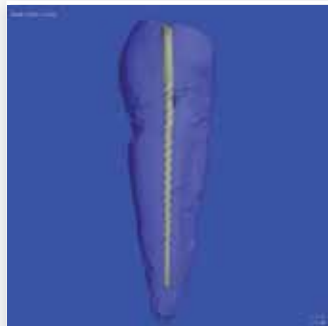
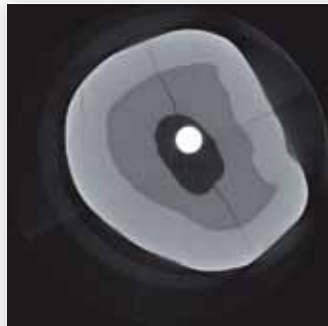


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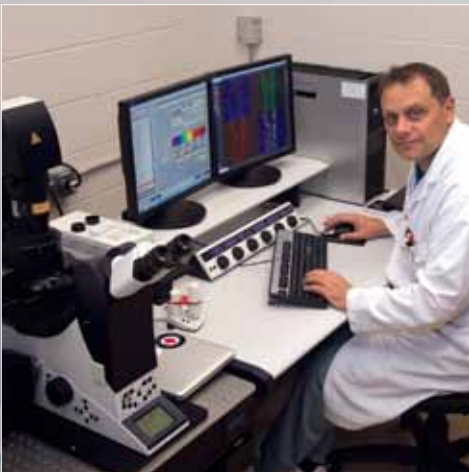
Craniofacial Science

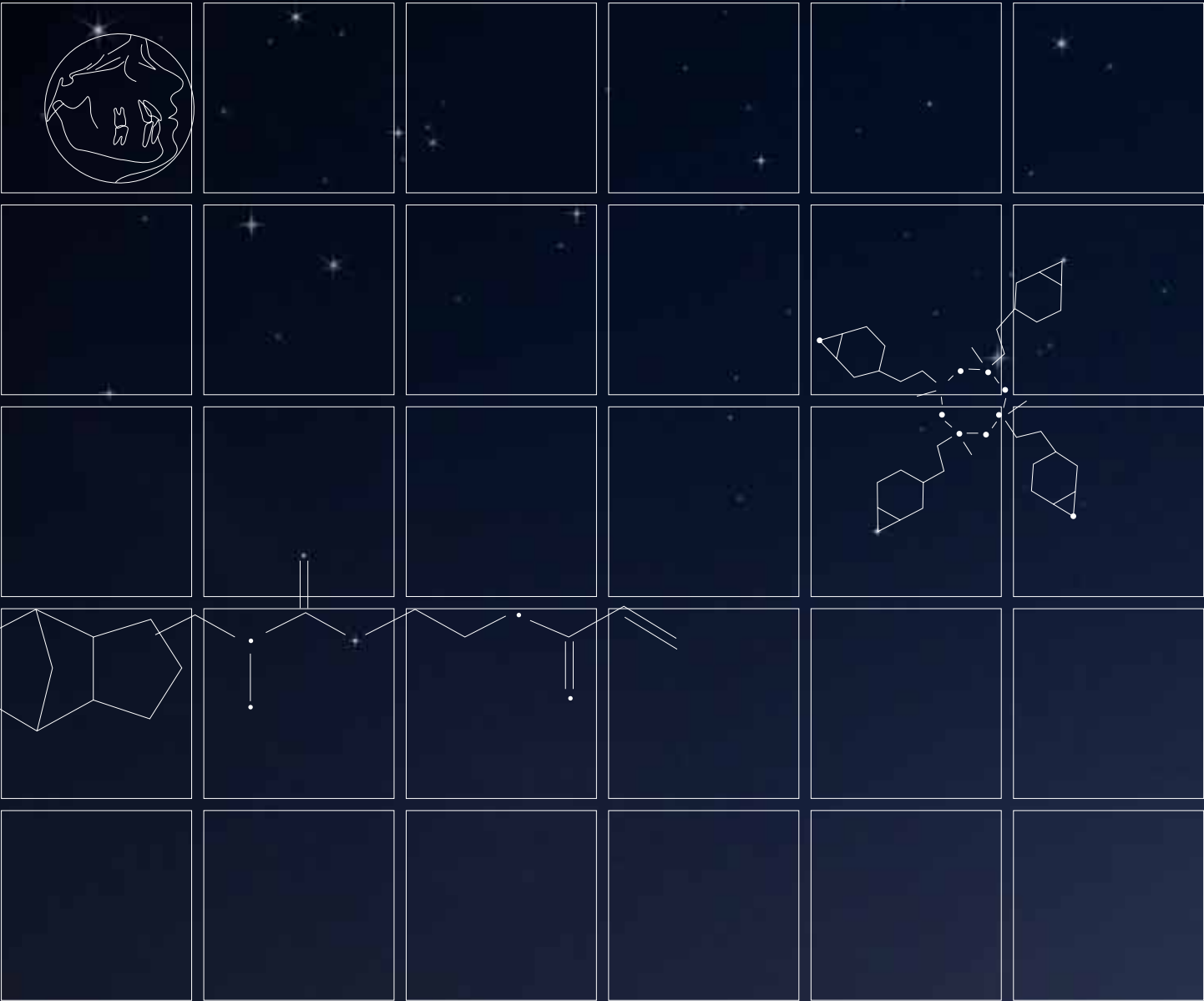
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