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THE UNIVERSITY OF BRITISH COLUMBIA

NCOHR 2014 Summer Research Institute

ADVANCED IMAGING METHODS IN CRANIOFACIAL AND ORAL HEALTH RESEARCH

JULY 14 - 18, 2014

Hosted by

The UBC Centre for High-Throughput

PHENOGENOMICS

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Advanced Imaging Methods in Craniofacial and Oral Health Research

Monday, July 14, 2014 · 8:45 am – 9:30 pm

John B. Macdonald Building (JBM)

8:45 – 9:00	JBM 218	REGISTRATION
9:00 – 9:30	JBM 218	WELCOME ADDRESS & INTRODUCTIONS **Dr. Nancy Ford,** Director, Centre for High-Throughput Phenogenomics (CHTP), The University of British Columbia (UBC) **Dr. Chuck Shuler,** Dean, Faculty of Dentistry, UBC **Dr. Ed Putnins,** Associate Dean of Research, Faculty of Dentistry, UBC
	Confocal Microscopy	
9:30 – 10:30	JBM 158/164	CELLULAR NETWORKS IN TISSUE REGENERATION **Dr. Fabio Rossi,** Canada Research Chair in Regenerative Medicine and Professor, Department of Medical Genetics, UBC
10:30 – 11:00	JBM 158/164	COFFEE BREAK
11:00 – 12:00	JBM 218	LEICA SP5X WHITE LIGHT LASER CONFOCAL: UNIQUE FEATURES AND THEIR APPLICATION **Reg Sidhu,** Applications Specialist, Leica Microsystems
12:00 – 1:30	JBM 218	LUNCH
	Optical Projection Tomography	
1:30 – 2:30	JBM 158/164	OPTICAL PROJECTION TOMOGRAPHY: A USE CASE FOR FETAL ALCOHOL EXPOSURE RESEARCH **Dr. Murat Maga,** Assistant Professor, Division of Craniofacial Medicine, Department of Pediatrics, University of Washington and Member, Center for Developmental Biology & Regenerative Medicine, Seattle Children's Research Institute
2:30 – 3:00	JBM 158/164	USING OPTICAL PROJECTION TOMOGRAPHY TO REVEAL A UNIQUE PATTERN OF CRANIOFACIAL DEVELOPMENT IN THE CHICKEN EMBRYO **Dr. John Abramyan,** Postdoctoral Research Fellow, Department of Oral Health Sciences, Faculty of Dentistry and Life Sciences Institute, UBC
3:00 – 3:30	JBM 158/164	COFFEE BREAK
	Research Translation	
3:30 – 4:30	JBM 158/164	TRANSFORMING DISCOVERY INTO OPPORTUNITY: COLLABORATING WITH ACADEMIC INVESTIGATORS TO DEVELOP NEW MEDICINES **Dr. Sam White,** Manager, Project Search & Evaluation, The Centre for Drug Research & Development (CDRD)
6:30 – 9:30	**Night Out**	

Advanced Imaging Methods in Craniofacial and Oral Health Research

Tuesday, July 15, 2014 · 8:45 am – 5:00 pm

John B. Macdonald Building (JBM)
Centre for High-Throughput Phenogenomics (CHTP)

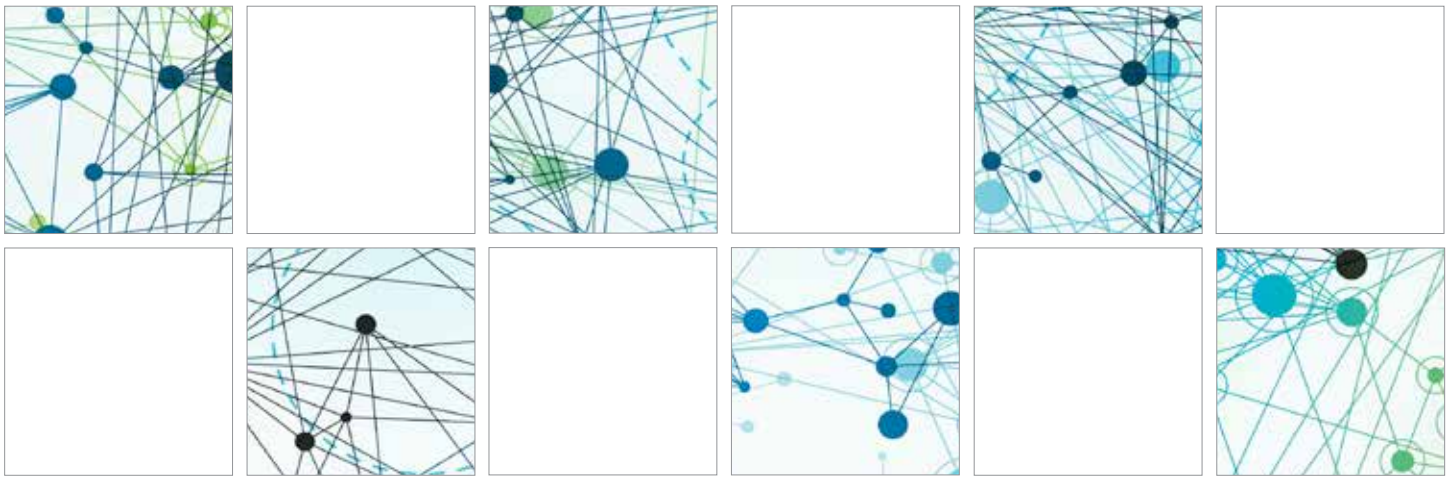
8:45 – 9:00	JBM 218	**DAILY OVERVIEW**
		MALDI Mass Spectrometry
9:00 – 10:00	JBM 158/164	**INTRODUCTION TO MASS SPECTROMETRY IN IMAGING** **Dr. Juergen Kast,** Professor, The Biomedical Research Centre, Department of Chemistry, and Centre for Blood Research, UBC
10:00 – 10:30	JBM 158/164	**COFFEE BREAK**
		Laboratory Demonstrations
10:30 – 12:00	CHTP	**DEMO SESSION #1** **Group 1:** Optical Projection Tomography **Group 2:** White Light Laser Confocal Microscopy **Group 3:** MALDI Mass Spectrometry
12:00 – 1:30	JBM 218	**LUNCH**
1:30 – 3:00	CHTP	**DEMO SESSION #2** **Group 1:** MALDI Mass Spectrometry **Group 2:** Optical Projection Tomography **Group 3:** White Light Laser Confocal Microscopy
3:00 – 3:30	Lobby	**COFFEE BREAK**
3:30 – 5:00	CHTP	**DEMO SESSION #3** **Group 1:** White Light Laser Confocal Microscopy **Group 2:** MALDI Mass Spectrometry **Group 3:** Optical Projection Tomography

Advanced Imaging Methods in Craniofacial and Oral Health Research

Wednesday, July 16, 2014 · 8:45 am – 5:00 pm

John B. Macdonald Building (JBM)

8:45 – 9:00	JBM 218	DAILY OVERVIEW
		Research Translation
9:00 – 10:00	JBM 158/164	INDUSTRY LIAISON, TECHNOLOGY TRANSFER, ROYALTY INCOME: A RESEARCH JOURNEY IN DENTISTRY **Dr. Alan Lowe,** Director, Frontier Clinical Research Centre and Professor, Department of Oral Health Sciences, UBC
		Micro-Computed Tomography
10:00 – 10:30	JBM 158/164	MICRO-CT MEASUREMENT OF THE INTERNAL FIT OF LITHIUM DISILICATE CROWNS **Dr. Chris Wyatt,** Professor, Department of Oral Health Sciences, UBC
10:30 – 11:00	JBM 158/164	COFFEE BREAK
11:00 – 12:00	JBM 218	MICRO-CT IN BIOMEDICAL RESEARCH: MOUSE TO MAN **Rasesh Kapadia,** Applications Specialist, Scanco Medical
12:00 – 1:30	JBM 218	LUNCH
1:30 – 2:30	JBM 158/164	OVEREXPRESSION OF SMAD2 INDUCES PERIODONTAL BONE LOSS **Dr. Chuck Shuler,** Professor, Department of Oral Biological & Medical Sciences, UBC
		Research Funding
2:30 – 3:30	JBM 218	SUPPORT FOR EARLY-STAGE RESEARCHERS **Dr. Chuck Shuler,** Dean, Faculty of Dentistry, UBC
		Scanning Electron Microscopy
3:30 – 4:00	JBM 158/164	COFFEE BREAK
4:00 – 4:30	JBM 158/164	EXPLORING THE SURFACE AND INTERNAL STRUCTURE OF REMINERALIZED AND INFECTED DENTIN USING FIB-SEM **Dr. Zhejun Wang,** Postdoctoral Research Fellow, Department of Oral Biological & Medical Sciences, UBC
4:30 – 5:00	JBM 158/164	SEM-BASED ULTRASTRUCTURAL ANALYSIS OF COLLAGEN AND ELASTIN DEGRADATION BY CYSTEINE PROTEASES **Dr. Neil Mackenzie,** Postdoctoral Research Fellow, Department of Oral Biological & Medical Sciences, UBC

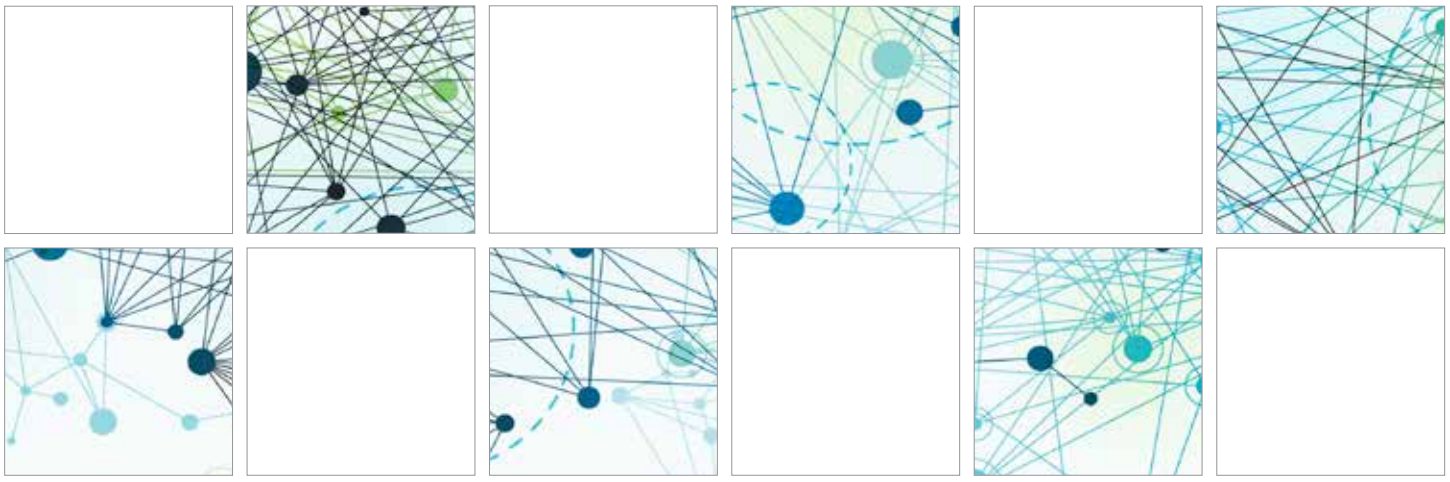


Advanced Imaging Methods in Craniofacial and Oral Health Research

Thursday, July 17, 2014 · 8:15 am – 5:00 pm

John B. Macdonald Building (JBM)
Centre for High-Throughput Phenogenomics (CHTP)

8:15 – 8:30	JBM 218	DAILY OVERVIEW
		Research Funding
8:30 – 9:30	JBM 218	RHETORIC FOR GRANT WRITERS **Dr. Don Brunette,** Professor, Department of Oral Biological & Medical Sciences, UBC
		Scanning Electron Microscopy
9:30 – 10:30	JBM 218	OVERVIEW OF THE HELIOS NANOLAB 650 **Gabriella Kiss,** Life Science Product Marketing Engineer, FEI
10:30 – 11:00	JBM 218	COFFEE BREAK
		Image Quantification
11:00 – 12:00	JBM 218	3D IMAGE PROCESSING WORKBENCH FOR TODAY'S IMAGE ANALYSIS NEEDS **Christian Wietholt,** AMIRA Product Marketing Engineer, FEI
12:00 – 1:30	JBM 218	LUNCH
		Laboratory Demonstrations
1:30 – 3:00	CHTP	DEMO SESSION #4 **Group 1:** AMIRA **Group 2:** Specimen Micro-Computed Tomography **Group 3:** Helios Scanning Electron Microscopy
3:00 – 3:30	Lobby	COFFEE BREAK
3:30 – 5:00	CHTP	DEMO SESSION #5 **Group 1:** Helios Scanning Electron Microscopy **Group 2:** AMIRA **Group 3:** Specimen Micro-Computed Tomography



Advanced Imaging Methods in Craniofacial and Oral Health Research

Friday, July 18, 2014 · 8:15 am – 1:00 pm

John B. Macdonald Building (JBM)
Centre for High-Throughput Phenogenomics (CHTP)

8:15 – 8:30	JBM 218	**DAILY OVERVIEW**
	Laboratory Demonstrations	
8:30 – 10:00	CHTP	**DEMO SESSION #6** **Group 1:** Specimen Micro-Computed Tomography **Group 2:** Helios Scanning Electron Microscopy **Group 3:** AMIRA
	Research Funding	
10:00 – 10:30	JBM 218	**COFFEE BREAK**
10:30 – 11:30	JBM 270D	**RESEARCH ROUND TABLE (1): CIHR CLINICIAN-SCIENTIST RECIPIENT** **Dr. Hugh Kim,** Assistant Professor, Department of Oral Biological & Medical Sciences, UBC
	JBM 270E	**RESEARCH ROUND TABLE (2): CFI NEW INITIATIVES FUND RECIPIENT** **Dr. Ed Putnins,** Associate Dean of Research and Professor, Department of Oral Biological & Medical Sciences, UBC
	JBM 270F	**RESEARCH ROUND TABLE (3): CORE RESEARCH FACILITIES** **Dr. Nancy Ford,** Director, Centre for High-Throughput Phenogenomics and Assistant Professor, Department of Oral Biological & Medical Sciences, UBC
11:30 – 1:00	JBM 218	**LUNCH**

NCOHR

Network for Canadian
Oral Health Research
Réseau canadien de recherche
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"The primary resource for initiating, supporting, and sustaining innovative and collaborative oral health research designed to benefit the health of all Canadians: Healthy mouths – healthy bodies."

The Network for Canadian Oral Health Research (NCOHR) is pleased to provide funding support for the 2014 Summer Research Institute: "Advanced Imaging Methods for Craniofacial and Oral Health Research."

NCOHR's primary focus is building capacity for oral health research in Canada. The network was established in June 2012 through a Catalyst Network grant from the Institute of Musculoskeletal Health and Arthritis (IMHA) of the Canadian Institutes of Health Research (CIHR) together with in-kind and financial support from many generous partners.

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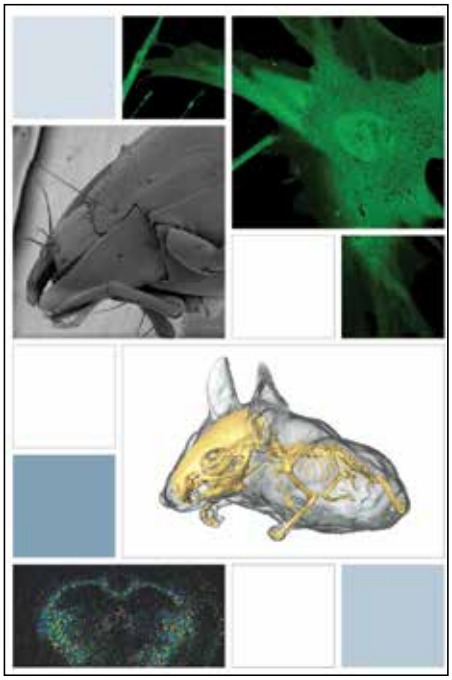
The Centre for High-Throughput Phenogenomics acknowledges funding from the Canada Foundation for Innovation, the British Columbia Knowledge Development Fund, and UBC Dentistry, along with in-kind contributions from Gamma Medica, Leica Microsystems, FEI, Systems for Research, Scanco Medical, and Thermo Fisher Scientific.

Introducing Your New Imaging Facility Supporting R&D

The Centre for High-Throughput Phenogenomics officially opened February 2013 with generous support from the Canada Foundation for Innovation (CFI), the BC Knowledge Development Fund and UBC's Faculty of Dentistry. Collectively $10.1 million has been invested in the Centre. This core facility supports a wide variety of research projects from across universities, research organizations, and is equally committed to supporting the R&D needs of corporate users in the Province of British Columbia and Canada. The Centre provides two- and three-dimensional sample imaging and data analysis. Hard and soft biological tissue and non-biological specimens are imaged using the following modalities:



Scanning Electron Microscopy

- Extreme high resolution (1 nm) characterization in 2D & 3D
- Quantitative elemental analysis
- Crystal structure characterization
- Micromachining and nanomanipulation
- Cold stage available
- Sample preparation for SEM, STEM, EDX, EBSD

Optical Imaging

Confocal Microscopy

- Temperature and CO_2 controlled environmental chamber for extended live-cell imaging
- Tunable white light laser can support simultaneous imaging with up to 7 fluorophores and managing autofluorescence
- High-sensitivity detector
- FRET and FRAP imaging capabilities

Laser Capture Microdissection

- High-throughput microdissection of cells from frozen or FFPE tissues
- Recovery of viable living cells from cell and tissue cultures
- Supports cell-specific genomic (DNA, RNA) and proteomic analysis

Optical Projection Tomography

- High-resolution 3D imaging of both fluorescent and non-fluorescent biological specimens
- 3D surface mapping of wholemount embryos
- 3D gene and protein expression

X-ray Imaging

- High-resolution (5-100 µm) specimen imaging for intact samples or excised organs/tissues
- *In vivo* imaging of preclinical rodent models
- Respiratory- and cardiac-gated image acquisitions
- Pre-approved protocols for imaging soft tissue, bone and gated acquisitions
- Integrated state-of-the-art vivarium supporting long-term *in vivo* micro-CT imaging with housing and procedure space
- Customized imaging protocols to suit different sample types

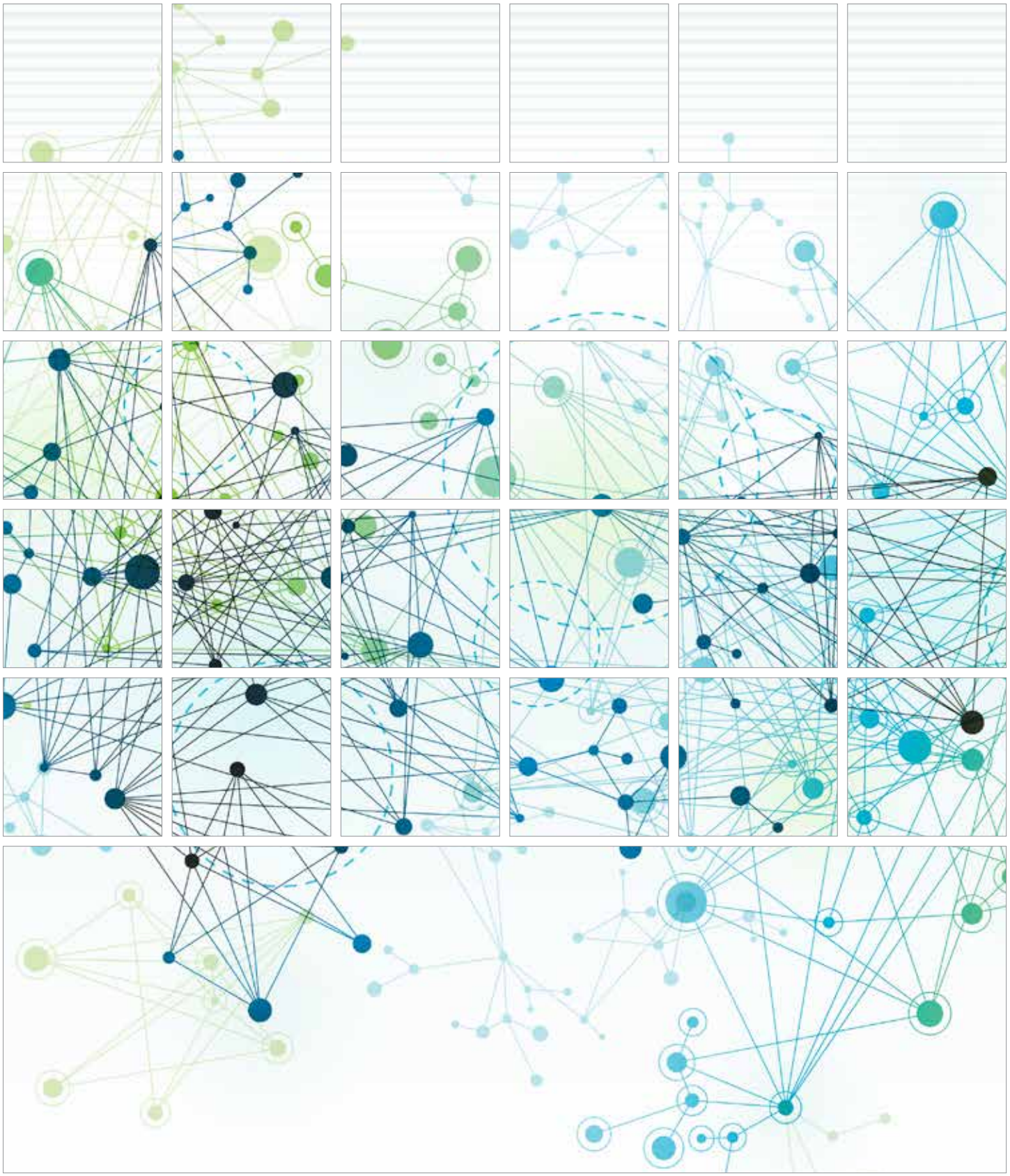
MALDI Mass Spectrometry

- Qualitative 2D mapping of peptides, proteins, lipids, drugs/metabolites in tissue sections
- Measurement of hundreds of molecular targets in parallel in each tissue section
- Label-free; antibodies, probes, fluorescent dyes or radiolabels typically not required
- Quantitative analysis of individual compounds with external standards
- Customized protocols available for different compound classes
- Valuable for biomarker discovery and diagnostics; drug and metabolite distribution studies, etc.

Through the presence of this broad range of imaging equipment with resolutions ranging from the millimeter to micrometer to nanometer scale together in one Centre, the exciting opportunity to do correlative cross-platform imaging has emerged. Operator training for all equipment is provided and staff are available for image acquisition and data analysis. High-end graphic workstations for 2D and 3D data analysis are available.

Director: Dr. Nancy Ford
Email: nlford@dentistry.ubc.ca
Director Phone: 604-822-6641

The UBC Centre for High-Throughput
PHENOGENOMICS



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