51st Canadian Mineral Analysts Conference and Exhibition

PROGRAM AND ABSTRACTS
September 8-12, 2019

Hosted By:

ColdBlock™ Technologies Inc.

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AGAT Laboratories

BioLinc Goodman School of Business Brock University

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Bereskin & Parr
RAVINE VINEYARD
ESTATE WINERY

Table of Contents

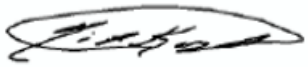
Welcome Messages

Nick Kuryluk, CEO, ColdBlock Technologies Inc.

On behalf of our team, it is my pleasure to welcome you to the 51st Canadian Mineral Analysts Conference, held in Niagara Falls, Ontario. We are highly committed to support the Canadian Mineral Analysts Association and organizing this year's meeting.

We are proudly situated in the Niagara Region, leveraging the incredible social, environmental, academic and industrial surroundings. We are truly grateful and excited to host the conference for the first time in Niagara Falls. We encourage you to actively participate and enjoy all that this region has to offer.

I thank our team for their dedication to help organize this conference, as well as, Agilent Technologies, AGAT Labs and BioLINC for actively reaching out and becoming members of the organizing committee. I also thank all exhibitors and sponsors. As a not-for-profit organization, the Canadian Mineral Analysts Association counts on your generosity to bring together this close-knit community. It cannot be done without your help.
Sincerely,



Dr. Ian Brindle, Honorary Conference Chair and Professor Emeritus of Chemistry, Brock University

Welcome to Niagara and to the Canadian Mineral Analysts Association meeting. I know that organizers have arranged an excellent and memorable program of talks and events that you will enjoy while you are in Niagara.

While we marvel at the 8th Wonder of the World, I would like to remind you of the important history of Niagara Falls that relates directly to the CMA.

Cyanamid, a former giant in the production of chemicals for the mining industry, got its start in Niagara Falls. Cyanamid produced essentially all of the cyanide that was needed for the American gold mines during the First World War, along with explosives for munitions and mining. Abrasive minerals companies, such as Norton, built here to take advantage of the electrical energy that was generated by harnessing Niagara's falling water (2,400 tonnes per second!) to make silicon carbide and corundum. Not too far from Niagara Falls, in St. Catharines, the Tyler Company made their famous Tyler sieves that you will find in labs and mining operations across the world.

I hope that you enjoy your stay in Niagara and as well as taking in the CMA meeting, that you will also take the opportunity to visit our wineries, restaurants, and other attractions.

Sincerely,

Mishka Balsom, President & CEO, Greater Niagara Chamber of Commerce

It is with great pleasure that I bid you welcome to Niagara for the 2019 Canadian Mineral Analysts (CMA) Conference and Exhibition. Your profession is a hugely important one for Canada, and your work touches, in some way, every industry and every facet of our economy. We are honoured that you have chosen our region for this year's meeting.

The Greater Niagara Chamber of Commerce (GNCC) is the voice of Niagara's business community and the largest business organization in the region. We are always glad to welcome visitors to our corner of the country. There is much to see and do in Niagara, and I hope that, during your stay with us, you will be able to enjoy some of the delights of the Niagara peninsula. Our region is the site of one of the busiest border crossings in Canada, a home to many businesses in trade, logistics, and manufacturing, and the location of two major post-secondary educational institutions. However, we are also renowned for our natural beauty, our rural charm, our vineyards, and our relaxed pace of life. I am sure that you will be able to make your attendance at the CMA conference not only professionally productive, but personally enjoyable.

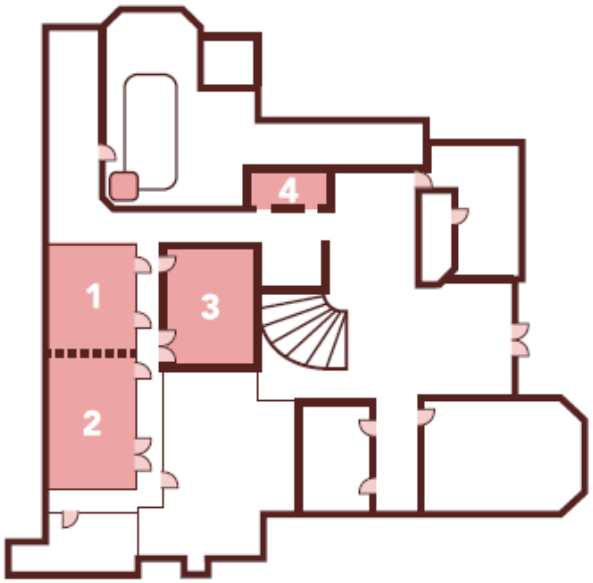
Please accept my best wishes for a fruitful conference and my thanks, again, for coming to our region.

Sincerely,

M. Balsom

SINCERE BEST WISHES FROM MAYOR JIM DIODATI
& MEMBERS OF NIAGARA FALLS CITY COUNCIL
niagarafalls.ca

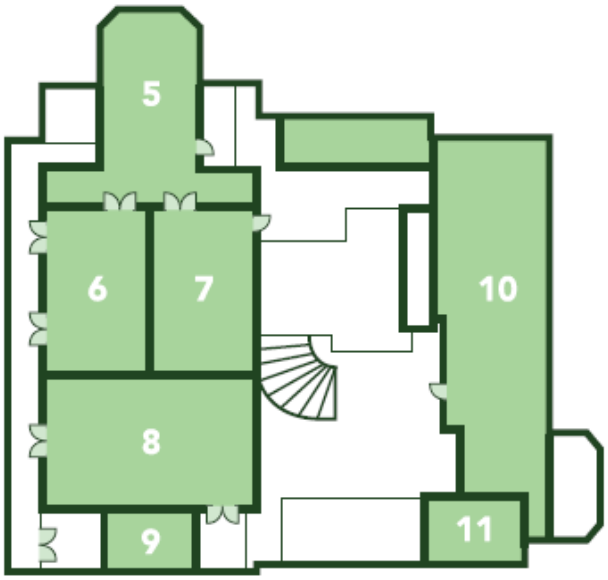
Conference Floor Plan



Lobby Level

Key

Room 1: Hennepin North
Room 2: Hennepin South
Room 3: Peninsula
Room 4: Business Centre



Mezzanine Level

Key

Room 5: Oakes Foyer
Room 6: Oakes North West
Room 7: Oakes North East
Room 8: Oakes South
Room 9: Stage
Room 10: Milestones Fallsview Restaurant
Room 11: Private Dining Room

Exhibit Halls Overview

Exhibits are located in the Foyer & Oakes North Ballroom, Mezzanine Level at the Marriott On The Falls

Exhibit Hours

Exhibit Hall Times		
Exhibitor Set-Up	Monday September 9, 2019	8:30 am - 1:00 pm
Exhibit Hall Hours	Monday September 9, 2019	1:00 pm - 5:30 pm
	Tuesday September 10, 2019	8:00 am - 5:30 pm
	Wednesday September 11, 2019	8:00 am -10:45 am
Exhibit Tear-Down	Wednesday September 11, 2019	10:45 am - 2:00 pm

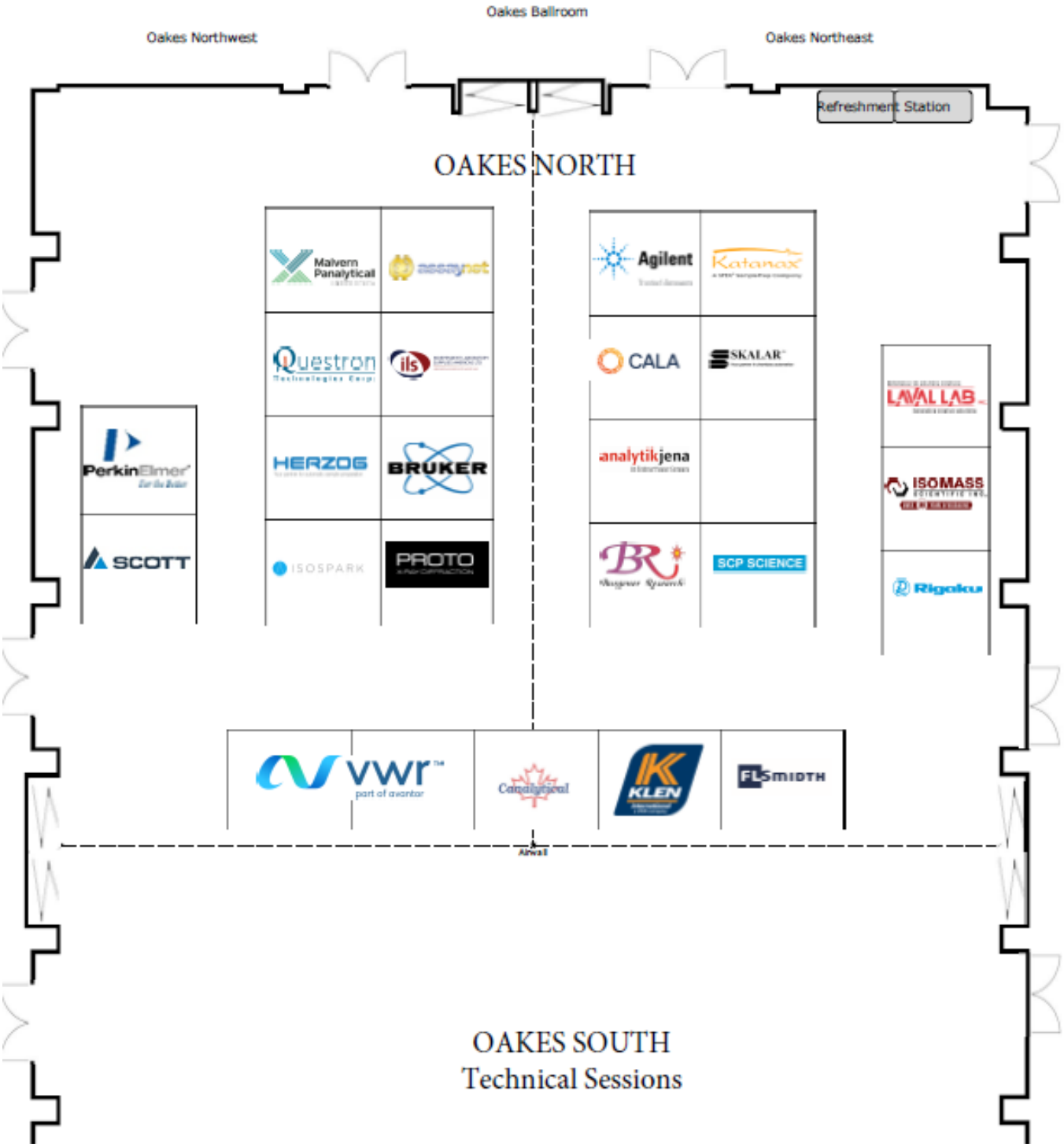
Exhibitor List

Booth #	Company Name	Booth #	Company Name
1	Metrohm Canada Inc.	26	Scott Technology
2	LECO Corporation	28	PerkinElmer
3	Inter Fusao / Thermo Fisher	30	Malvern Panalytical
4	Geoscience Laboratories	31	Questron Technologies Corp.
5	Prolite Systems Inc.	32	Herzog Automation Corp.
10	Delta Scientific	33	IsoSpark Analytical Solutions
11	Romquest Technologies	34	Proto XRD
12	Elemental Scientific	35	Bruker Corporation
13	XRF Scientific Americas Inc.	36	Independent Lab Supplies
14	Thermo Fisher Scientific	37	Assaynet Canada Inc.
15	Laval Lab Inc.	38	Agilent Technologies
16	Isomass Scientific Inc.	39	CALA
18	Rigaku	40	Analytik Jena
19	FLSmidth Ltd.	41	Burgener Research
21	Klen International	42	SCP Science
22	Canalytical	43	
24	VWR/Anachemia	44	Skalar
25	VWR/Anachemia	45	Katanax

Technical Presentation and Exhibitor Award Ballots

- The ballots for best technical presentation and best exhibitor will be collected on Wednesday, September 11 at 11:45am. The winners will receive an award!

Exhibit Halls Floor Plan


Oakes Ballroom
Oakes Northwest
Oakes Northeast
Refreshment Station
OAKES NORTH
Malvern Panalytical
Agilent
Katanax
Questron
CALA
SKALAR
LAVAL LAB
PerkinElmer
HERZOG
BRUKER
analytikjena
ISOMASS
SCOTT
ISOSPARK
PROTO
SCP SCIENCE
Rigaku
vwr
part of avantor
KLEN
FLSmidth
OAKES SOUTH
Technical Sessions

Exhibitor Descriptions

Analytik Jena
www.analytik-jena.com
Booth #40

Analytik Jena is a leading provider of high-end analytical measuring technology, of instruments and products in the fields of biotechnology and molecular diagnostics, as well as of high-quality liquid handling and automation technologies. Its portfolio includes traditional analytical technology, particularly to measure concentrations of elements and molecules, as well as systems for bioanalytical applications in the Life Science area spanning the highly complex analytic cycle of a sample from sample preparation to detection. Automated high-throughput screening systems for the pharmaceutical sector are also part of this segment's extensive portfolio. Analytik Jena´s products are focused to offer customers and users a quality and the reproducibility of their laboratory results. Services, as well as device-specific consumables and disposables, such as reagents or plastic articles, complete the Group's extensive range of products. Analytik Jena is part of the Swiss Endress+Hauser Group.

Agilent Technologies
www.agilent.com
Booth #38

Agilent Technologies leads the industry with robust, reliable instruments that provide the ability to analyze, confirm and quantify substances of interest. Our workflow solutions enable you to maintain stringent practices from sample preparation, through analysis, to final report. When combined with our informatics architecture, large quantities of data can be managed while preserving the integrity and security of the results. Agilent offers a complete line of GC, LC, MS and Spectroscopy instruments and technologies, as well as the related consumables, support and services. For more information visit our website – www.agilent.com.

AssayNet Canada Inc.
www.assaynet.com
Booth #37

AssayNet is a LIMS supplier for minesite labs. AssayNet's team has leveraged its experience in Minesite Assay Laboratories to offer a total solution for managing lab data. AssayNet has built its success on a thorough knowledge of the industry, a high degree of professionalism, and strong commitment to its clients.

Burgener Research
www.burgenerresearch.com
Booth #41

Burgener Research is a leading developer and manufacturer of high stability, high sensitivity analytical nebulizers. We supply nebulizers for ICP and ICP-MS as well as specialty applications. Made from Teflon, Peek or stainless steel, our nebulizers are durable, non-salting and non-plugging. Our vast product selection allows the user to run samples at flow rates ranging from 200 nanoliters/min up to 100 ml/min.

Bruker Corporation
www.bruker.com
Booth #35

Bruker enables scientists to make breakthrough discoveries and develop new technologies by providing high-performance scientific instruments and high-value analytical solutions which supports exploration of materials at atomic, molecular, cellular and microscopic levels. Our innovative solutions enable a wide range of customers such as heavy industry, chemistry, pharmacy, semiconductor, solar, life science, nanotechnology, and academic research.
https://www.bruker.com/.

CALA
www.cala.ca
Booth #39

CALA is an internationally recognized leader in providing the highest-quality accreditation of testing laboratories. Our commitment to objectivity and data integrity gives CALA-accredited laboratories lower risk and competitive advantage by ensuring that their customers receive data that can be trusted. We provide a unique combination of rigour, deep expertise and exceptional customer service that leads the way in ensuring that CALA-accredited laboratories are among the best in the world.

Laboratories that gain CALA accreditation to the ISO/IEC 17025*: General Requirements for the Competence of Testing and Calibration Laboratories* standard, can provide assurance to their customers about their laboratory's quality and competence based on their participation in a rigorous program of inter-lab comparison and on-site assessments based on international standards. CALA training ultimately supports laboratory best practices and continuous improvement in their laboratory environment. Visit www.cala.ca for a full overview of our services.

Canalytical
www.canalytical.com
Booth #22

Canalytical Instrumentations Services has been providing high quality instruments from major manufacturers to the Canadian analytical and testing market since 1997.

The Canalytical team, working closely with our manufacturers, are committed to fitting the ideal instrument to the requirements of the our customers. Our line of products includes ICP-OES, Arc/Spark Emission, EDX, Mercury Analyzers, DC Arc Spectrometer, Atomic Absorption as well as a full line of physical testing and balances.

ColdBlock Technologies
www.coldblock.ca
Conference Host

ColdBlock™ Technologies offers a novel and innovative sample digestion technology, ColdBlock™ Digestion. This versatile and very rapid, patented technology shortens the sample digestion process from hours to minutes with reliable and precise results consistently demonstrated across a variety of sample types.

Delta Scientific
www.delta-sci.com
Booth #10

Delta Scientific is registered to ISO 9001:2015 and specializes in supplying chemicals, consumables, equipment, ICP & ICP-MS standards & components, AA & XRF supplies and proficiency testing standards.

Elemental Scientific Inc.
www.icpms.com
Booth #12

Elemental Scientific has been providing high-quality solutions to meet the specialized needs of labs worldwide. Specifically, for this venue, we will be promoting the prepFAST-MC™ which is a fully automated, low-pressure chromatography system that isolates elements of interest from the sample matrix and collects multiple discrete eluent fractions for precise isotopic analysis. The syringe-driven system allows sample loading, multiple acid washes, column conditioning and elution cycles all at user-defined intervals (time, volume and flow rate). Visit Booth 29 to discuss!

FLSmidth Ltd. www.flsmidth.com **Booth #19**	**FLSmidth** is a leading supplier of productivity-enhancing solutions to the global mining industry. Through our unique combination of engineering, products and services, we help our customers increase their production output, lower operating costs and minimise environmental impact. With full flowsheet coverage and a lifecycle approach, we enable customers to reduce total cost of ownership over the lifetime of their mine. Our key to productivity is a full flowsheet of premium sustainable technologies, combined with strong process know-how and a broad range of services. Within the mining value chain, FLSmidth is mostly active in material handling, comminution, materials testing and separation.
Geoscience Laboratories https://www.mndm.gov.on.ca/en/mines-and-minerals/geology/geoscience-topics/geochemistry **Booth #4**	**The Geoscience Laboratories (Geo Labs)** within the Ministry of Energy, Northern Development and Mines (MENDM) provides research quality geoanalytical data in support of the program of the Mines and Minerals Division and the minerals industry client groups. Geo Labs is a full-service inorganic analytical facility, specializing in research grade analyses and services to the Ontario Geological Survey, government, academia, and the private sector.
Herzog Automation Corp. www.herzogautomation.com **Booth #32**	Herzog Automation Corp. is the leading supplier of manual and fully automatic sample preparation systems for spectrographic and x-ray analysis, tube delivery systems for sample transport, and laboratory automation for the cement, mining, steel and aluminum, industries. Please visit our website at www.herzogautomation.com for our full product line.
Independent Laboratory Supplies Americas Ltd. www.indlabsupplies.com **Booth #36**	**INDEPENDENT LABORATORY SUPPLIES (ILS)** is an independently owned and operated company focusing solely on the supply and service of all your Mining Assay Laboratory requirements. Our head office is in Perth, Australia, and we are pleased to announce the opening of Independent Laboratory Supplies Americas Ltd (ILS Americas), which provides our existing services to mining companies within North, Central and South America. Our new office and warehouse is in Sudbury, Ontario. ILS Americas is now starting to provide and distribute laboratory equipment, reagents and day-to-day consumables as well as laboratory technical services, such as audits, technical evaluations and onsite laboratory design and construction.
Inter Fusao/Thermo Fisher https://interfusaoti.com.br/ **Booth #3**	**InterCanada** is part of Interfusao's group, who is a leader in service excellence in LIMS system deployments and technical support. Focused on laboratory automation, we are Thermo Fisher Scientific certified partners where we provide LIMS, consulting, implementation, validation and support services. InterCanada has a qualified technical team of analysts, expert coordinators and managers. Today Interfusao, with InterCanada, brings over 13 years of experience in laboratory automation and is seen in the market as an innovative company that brings the most advanced technology applied to laboratories and research centers in the world to Canada.

Isomass Scientific Inc. www.isomass.com **Booth #16**	**Isomass Scientific** Inc**.** is an independent, full-service company that has served Canadian and American scientists since 1981. Our business revolves around supplying well proven, world class scientific instruments and providing the support required by our customer to obtain the very best of analytical results. With our partners we provide instruments, consumables, parts, service and training for all of the instruments we provide and those from many other manufacturers as well. We have built our reputation on the quality of service that we offer our customers. All the members of our service team are experienced and factory trained and certified to handle installations and provide after sales support. We are committed to providing quality service to ensure that users get the most from their instruments. At the Isomass head office in Calgary we warehouse a large selection of spares, parts and consumables in order to provide customers with a timely supply of the items they require to run their instruments on a day-to-day basis. Our sales team are available to answer questions by email or telephone. We believe that personal contact is very important and maintain a live receptionist to take voice calls. Please feel free to call us at 1-800-363-7823 to discuss any of the products we provide. Alternatively, please email sales@isomass.com. Isomass celebrated 35 years of business in 2016.
IsoSpark Analytical Solutions www.isospark.com **Booth #33**	Founded in 2013, **ISOSPARK** quickly established itself as a premier distributor of analytical instrumentation with full in-house capabilities in sales, service, application support and marketing. Our customer list covers the spectrum from small to large international companies, academia and governments in many different industries and countries. ISOSPARK operates throughout North, Central and South America with a head office located in Montreal, Canada. Representing with exclusivity the Spectro, EDAX and Nu brands of Ametek's material analysis division along with the Los Gatos Research and FT-IR groups of ABB. ISOSPARK specializes in Arc/Spark Optical Emission Spectroscopy (OES), Inductively Coupled Plasma Spectroscopy (ICP), Inductively Coupled Plasma Mass Spectrometry (ICP-MS), Glow Discharge Mass Spectrometry (GD-MS), Isotope Ratio Mass Spectrometry (IRMS), Noble Gas and Thermal Ionisation Mass Spectrometry (TIMS), Off-Axis Integrated Cavity Output Spectroscopy (OA-ICOS), Fourier Transformed Infrared Spectroscopy (FT-IR), and Ultraviolet-Visible spectroscopy (UV-Vis).
Katanax www.katanax.com **Booth #45**	**Katanax** manufactures and sells electric fusion machines (fluxers), used in inorganic sample preparation for XRF, ICP and AA. Equipment is easy to install, use and maintain. Affordable, fully automatic, energy efficient produces highly accurate and reproducible results.

KLEN International amcguire@klen.com.au **Booth #21**	**KLEN International** specialises in the manufacture of certified reference materials (CRM's), fire assay flux, x-ray flux and supply of consumables within the mining and geochem laboratory market. KLEN is fully accredited under ISO 9001 and is one of the few ISO 17034 accredited CRM producers as well as the leading manufacturer of fire assay flux globally. With free consolidation services in conjunction with our global reach, KLEN is the perfect choice for all your fire assay requirements. Speak to Angus McGuire at booth 21 for more information or email amcguire@klen.com.au
Laval Lab Inc. www.lavallab.com **Booth #15**	**Laval Lab Inc.** is a Canadian supplier of laboratory equipment for the Mining ad Metallurgy industries. Laval Lab's website https://lavallab.com/ displays the company's complete line of equipment. Product lines include sample preparation (crushers, grinders, pulverizers), particle size analysis (sieve shakers, particle size analyzers, test sieves), sample division, platinum labware, drying ovens and water testing instruments. Highly experienced staff takes pride in generating creative solutions to help clients increase efficiency and accuracy in laboratory analyses.
LECO Corporation www.leco.com **Booth #2**	Since 1936, millions of samples worldwide have been analyzed using **LECO** instruments for elemental analysis, thermal analysis, metallography, and mass spectrometry. Our comprehensive solutions for improving productivity include working with you to find the right equipment for the type of analysis you are doing — and providing you with the training, application support, and service you need to keep your lab running at its best.
Malvern Panalytical www.malvernpanalytical.com **Booth #30**	A new era at **Malvern Panalytical**...Two great organizations have combined forces – our engineering, software development, expertise and service are driven to bring value to our customers so they can confidently explore new materials, design and test their materials, and efficiently produce high quality products. Our mining solutions provide our customers with highly reliable, robust elemental, morphological and structural information that can help identify pathfinder minerals, determine quality of ore, and provide certified analysis of your beneficiated material. Our analytical instrumentation and solutions set new standards in data quality, functionality, flexibility and value. Visit Malvern Panalytical at booth 30.
Metrohm Canada Inc. www.metrohmca.com **Booth #1**	**Metrohm** is one of the world's most trusted manufacturers of high-precision instruments for chemical analysis. Instruments for ion chromatography, voltammetry, conductivity, and stability measurement make our portfolio for ion analysis complete. Near-infrared and Raman spectroscopy is another, strongly growing segment of our portfolio. Metrohm was founded in 1943 by engineer Bertold Suhner in Herisau, Switzerland and today, we are present in more than 80 countries with our own subsidiaries and exclusive distributors.

PerkinElmer Canada www.perkinelmer.com **Booth #28**	Every day, we make an impact. **PerkinElmer** enables scientists, researchers and clinicians to address their most critical challenges across science and healthcare. With a mission focused on innovating for a healthier world, we deliver unique solutions to serve the diagnostics, life sciences, food and applied markets. We strategically partner with customers to enable earlier and more accurate insights supported by deep market knowledge and expertise. Our dedicated team of 12,500 employees worldwide is passionate about helping customers work to create healthier families, improve the quality of life, and sustain the wellbeing and longevity of people globally. We will showcasing our Inorganic Portfolio at the 2019 CMA which includes our NexION ICPMS, Avio ICP-OES and PinAAcle AA Spectrometers.
Prolite Systems Inc. www.prolitepiping.com **Booth #5**	**Prolite Systems Inc.** is a Canadian based international thermoplastic manufacturer, custom fabricator and distributor specializing in dual laminates and many other types of plastic industrial and municipal corrosion resistant process equipment. Our custom fabrication facilities affords us to be the leader in design of thermoplastics, dual laminates, fume hoods, acid scrubbers, piping and tanks. Our services include everything from design and manufacturing, to transport and installation.
Proto XRD www.protoxrd.com **Booth #34**	With its headquarters located in Windsor, Ontario, **PROTO Manufacturing** is the only Canadian-based x-ray diffraction (XRD) company. Whether you need to determine the composition of raw materials in a mine or characterize cement products, you can count on our versatile powder diffractometers to provide accurate results. Our compact Benchtop system is full-featured yet highly cost effective. The Theta-Theta system provides a unique solution for high-temperature diffraction, with temperature stages from 500-2000˚ C, in the convenience of a compact footprint. Finally, the powerful LPD laboratory system can be configured with a variety of options to suit your needs. PROTO's other products include custom XRD systems, x-ray tubes, and Laue systems for single-crystal orientation.
Questron Technologies Corp. www.qtechcorp.com **Booth #31**	**Questron Technologies Corp**. Company Profile - Manufacturer of durable, long-lasting acid digestion equipment. We provide analytical laboratories, interested in metals analysis, with innovative and complete solutions for their sample preparation needs. Since the early 1990's, Questron has been at the forefront of design for microwave, block and automated block digesters, microwave ashing and automated dispensing/diluting equipment. Questron supplies worldwide in the mining, agriculture, environmental, and food industries. Questron's team of experienced engineers and application specialists provide customized designs to accommodate customer's special and unique sample prep needs. Visit us at www.QTechCorp.com or contact us at 1-844-323-1223 or info@qtechcorp.com for more information.

Rigaku www.rigaku.com **Booth #18**	**Rigaku Corporation** provides the world's most complete line of X-ray diffraction and X-ray fluorescence instruments and components, including benchtop XRD and XRF systems, X-ray optics and detectors, single crystal diffractometers for chemical crystallography, multi-purpose diffractometers with SAXS and in-plane capabilities, and high-powered WDXRF spectrometers. Founded in 1951 in Tokyo (Japan), Rigaku Corporation is a global leader in X-ray and thermal analysis, automation solutions and non-destructive testing. Rigaku employs more than 1,400 people in the development, manufacturing, marketing and support.
Romquest Technologies Corp www.romquest.com **Booth #11**	**Romquest Technologies** is the exclusive Canadian distributor for reputable manufacturers of high-quality analyzers and consumables from Europe and USA. Our product lines include: Eltra Elemental Analyzers, Eurovector CHNS/O and N-Protein Analyzers, Belec Optical Emission Spectrometers, Elvatech XRF Analyzers, LAC Laboratory furnaces and dryers, Radwag Balances & Scales and Alpha Resources consumables, supplies and certified standards for elemental analyzers/ICP/AA/MS.
Scott Technology www.scottautomation.com **Booth #26**	**SCOTT** specializes in the design and manufacture of automated production, robotics and process machinery. A leading expert in automation & robotic solutions globally that improve productivity, reliability, yield, and safety for manufacturers and processors in industries. Widely recognized, as a world-class builder of advanced automation systems, particularly for the appliance, meat processing, mining and superconductor industries globally.
SCP Science www.scpscience.com **Booth #42**	**SCP SCIENCE** is a manufacturer of specialized products for atomic spectroscopy, proudly serving the inorganic analytical chemistry market since 1980. The privately-owned, Canadian company employs over 160 employees in Baie D'Urfé (Montreal), Québec, and several additional employees worldwide. In the head office, there are extensive Research & Development, Engineering, Service and Quality Assurance departments. The company has grown substantially in recent years through the development of extensive internal manufacturing capability, acquisition of several companies which have been incorporated into the main company, and expansion of its sales and distribution network around the world. SCP SCIENCE manufactures Robotics (*Easy*PREP Sample Handler), Digestion Blocks and Microwave Digestion Systems (*Digi*PREP, *Nova*WAVE and *Mini*WAVE), as well as standards and supplies for ICP/ICPMS, XRF and AA. SCP SCIENCE is ISO 9001 Registered and ISO 17025 and ISO 17034 Accredited.
Skalar www.skalar.com **Booth #44**	**Skalar** is a Dutch company, established in 1965 as a producer of analyzers for the laboratory and process industry. It has since grown into a multinational organization with its own subsidiaries in most European countries, USA, Canada and India and with over eighty representatives throughout the world. Our organization is daily focused on servicing and providing the best application support to existing and potential users. Skalar analyzers are reliably servicing small and large routine laboratories, annually handling sample numbers of a few hundred up to hundreds of thousands.

Thermo Fisher Scientific www.thermofisher.com **Booth #14**	**Thermo Fisher Scientific Inc.** is the world leader in serving science. Our mission is to enable our customers to make the world healthier, cleaner and safer. We have approximately 70,000 employees globally and serve over 350,000 customers within geochemistry. Pharmaceutical and biotech companies, universities, research institutions and government agencies, as well as environmental and industrial process control settings. We help our customers accelerate life science research, solve complex analytical challenges, improve patient diagnostics, deliver medicines to market and increase laboratory productivity. Through our premier brands – Thermo Scientific, Applied Biosystems, Invitrogen, Fisher Scientific and Unity Lab Services – we offer an unmatched combination of innovative technologies, purchasing convenience and comprehensive services to our customer partners to help them gain the competitive edge. Thermo Fisher Scientific corporate values are Integrity, Intensity, Innovation and Involvement. We fulfill our mission by working every day in accordance to these values. They are the core of who we are and how we define ourselves. For more information, please visit www.thermofisher.com
VWR/Anachemia-part of Avantor www.vwr.com **Booth #24-25**	**VWR/Anachemia** supplies laboratory equipment, supplies and chemicals for the mining industry. We offer products for: • Fire Assay: Cupellation and Fusion Furnaces, dust hoods, pre-mixed fluxes, cupels, crucibles, assay tools and safety supplies • Sample Preparation: Drying ovens, crushers, pulverizers, dust collection hoods, sample bags, balances • Metallurgical Lab: Mixers, Vacuum Presses, Sieves, Tanks, Mills, Bottle Rolls • Dust Extraction: Dust Hoods, Bag Houses, Make Up Air Units • Wet Chemistry: Complete line of products for any of your wet chemistry needs • Laboratory Furniture • Laboratory design: We work with consultants that have many years of experience in designing Mining Laboratories. • Chemicals: Pre Mixed fluxes, litharge, acids, Inquartz, silver foil, lead foil etc
XRF Scientific Americas Inc. www.xrfscientific.com **Booth #13**	**XRF Scientific** manufactures a complete product line of electric and gas fusion instruments, platinum labware, and a full range of Lithium granular and micro-bead fluxes for sample preparation. XRF Scientific's technology enables the optimal sample preparation for accurate, homogeneous and repetitive results to measure the composition and purity of materials for industrial quality and manufacturing control processes in industries, such as: metals and mining, construction materials, chemicals and petrochemicals. The company also offers refining services to reclaim the highest return value from used platinum accessories. Our sales team can assist you in English, Spanish and French. Visit www.xrfscientific.com for more information.

Workshop, September 9, 2019

Facilitator: Cathy Wylie, CALA
Time and Location: 8:30 am – 12:00 pm, September 9, 2019, Oakes South Ballroom

The ISO/IEC 17025 standard was revised in 2017 and all accredited laboratories need to update their management systems to meet the revised standard before the fall of 2020. The first step is understanding what has changed in the standard.

This course outlines the major changes to ISO/IEC 17025 and is intended for all laboratory staff. It provides a review of selected changes to the Standard and provides both the staff responsible for updating the management system documents and the rest of the laboratory staff with the information required on how the Standard will affect work in the laboratory. It uses easy to understand language and concepts, and guided exercises to build understanding of the changes to the standard. The rationale behind the changes is also provided, which will prepare you for the changes to your management system prompted by the new revision of the Standard.

Prerequisite: None

Who Should Attend

This course is intended for all laboratory staff who operate under the laboratory management system:

- Personnel conducting testing or calibration at all levels such as analysts, lab technicians and instrument operators, scientific professionals
- Supporting laboratory activities at all levels, such as sample reception, reporting, purchasing, quality
- Laboratory Managers and Quality personnel
- Any other personnel of the laboratory not captured in the above.

Course Overview

This course looks at selected changes to the Standard as it applies to general staff in the laboratory. It outlines the changes and the background to the changes in an understandable way. It is intended to provide an accessible overview of the changes, that will prepare the laboratory staff members for changes to their management system resulting from the revision to the Standard and will provide the personnel responsible for updating the management system with the details they need on the new requirements.

Objectives

After completing this course participants will be able to:

- Describe the new structure of the ISO/IEC 17025:2017 standard
- Understand the concept of risk-based thinking
- Interpret the new or changed requirements as it applies to their role in the laboratory
- Understand the rationale behind the changes
- Be prepared for the changes they may see in the laboratory management system as a result to the revision to the Standard

Automation Seminar, September 12, 2019

Time and Location: 8:00 am – 11:00 am, September 12, 2019, Hennepin South

Who Should Attend

Individuals who seek to find solutions to improve safety and efficiency of sample preparation systems and how automation can be integrated into day-to-day processes in a laboratory.

Automation Seminar Overview

- Current state of laboratory processes
- Current state of laboratory automation
- Which steps are best suitable for automation
- Automation solutions and examples
- Future prospects

Presenter 1: Sample Prep – Catching Up with Sample Analysis

Manjinder Phull, President and CEO
Questron Technologies Corp.
T: 1-844-363-1223
W: www.qtechcorp.com

Presenter 2: Automation of Sample Preparation Methods and Analysis in Mining and Mineral Processing Laboratories – A Review

Arnoux van der Westhuizen, Sales Manager, Automated Laboratory Solutions
FL Smidth
T: 905-829-2800
C: 289-259-0470
E: arnoux.vanderthuizen@flsmidth.com

Presenter 3: How Management Preferences Matter – An Industry Marketing Review on the Automation Decision

Alex Kuhnert
Ernesco Technical & Advisory Services Inc.
W: www.ernescotech.ca

Plenary Speaker Biographies

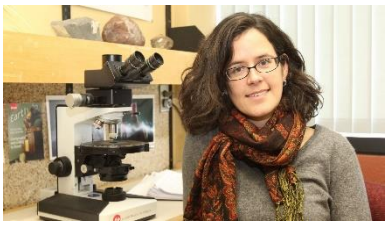
Norman M. Halden, Ph.D. P.Geo. F.G.S.
Dean, Clayton H. Riddell Faculty of Environment, Earth, and Resources, University of Manitoba.

Halden's research program has been extensively involved in the development and use of novel microbeam analytical techniques for the analysis of minerals. He has made innovative contributions using both low and high energy PIXE (proton-induced X-ray emission) and currently oversees the operation of the LA-ICP-MS facilities at the University of Manitoba. He has served and chaired several NSERC research committees dealing with major instrument installations. Halden's mineralogical research has been applied in northern Canada to a variety of petrological questions in the Trans Hudson Orogen, and oscillatory zoning in minerals. More recently he and his graduate students have been applying the new micro analytical techniques to the analysis of fish otoliths in areas impacted by mine tailings, and in the Arctic to manage migratory fish stocks.

Dr Ian Brindle
Professor Emeritus of Chemistry, Brock University

Dr. Ian Brindle recently retired from Brock University and is currently a Professor Emeritus of Chemistry. He was educated at the University of Manchester Institute of Science and Technology (UMIST) in the UK and at Brock University. UMIST awarded Ian its highest degree, the Doctor of Science, noting his "substantial and original contributions to the advancement of knowledge". He is a Fellow of the Royal Society of Chemistry and has authored more than 130 publications in analytical and environmental chemistry, wine chemistry, archaeometry, and assistive devices for handicapped chemists. He has received a number of awards, the most recent (2015) being the Johannes Marcus Marci Medal from the Czech Spectroscopic Society. He and a former student, Roger McLaughlin filed Brock University's first patent for the Multimode Sample Introduction System (MSIS), based on their work on the measurement of low concentrations of hydride-forming elements, such as arsenic.

Dr. Mariek E. Schmidt
Associate Professor, Department of Earth Sciences, Brock University



Mariek Schmidt is an Associate Professor of Earth Sciences at Brock University. Dr. Schmidt received a BA from Colby College in Maine before going on to graduate school at Oregon State University for a PhD where she worked on the volcanic and petrologic history of a volcano in the Cascade Range. For a postdoc, Dr. Schmidt jumped at the chance to expand beyond Earth, taking a position at the Smithsonian Museum of Natural History as a Collaborator on the Mars Exploration Rover mission. She is a volcanologist and igneous petrologist with research interests spanning both Earth and Mars. She is most interested in what volcanic rocks and environments on Earth can tell us about the Martian interior as well as potential habitable environments on Mars. She has ongoing terrestrial field research projects in Hawaii, New Mexico, Oregon, Nevada and Iceland. In addition, Dr. Schmidt is one of four Canadian Participating Scientists on the Mars Science Laboratory mission and a member of the Alpha Particle X-ray Spectrometer instrument team.

Technical Session, Monday September 9, 2019

"Chemometrics"

Time	Presenter	Organization	Title
07:00 AM	Breakfast – Milestones On The Falls **Sponsored By AGAT Laboratories**		
11:45 PM	Lunch – Milestones On The Falls **Sponsored By VWR**		
1:00	Dr. Norman M. Halden	University of Manitoba	Plenary Presentation; Rock & Mineral Analysis, just like the Earth, is continually evolving
1:45	Edgar F. Paski	Analytical Innovations	Decision Rules for Multianalyte Tests
2:15	Dr. Uwe Konig	Malvern Panalytical	Efficient downstream processing of ore – New methods for monitoring XRD and statistical methods
2:45	COFFEE BREAK & EXHIBITION VISIT	**IsoSpark Analytical Solutions**	Oakes Foyer and Oakes North
3:30	Dr. Marcus Burnham	Geoscience Laboratories	If You Spike Them, You Do Not Bleed – The Pros and Cons of Offline Internal Standard Addition
4:00	Maureen Leaver	Natural Resources Canada	Observations on Recent Data from CCRMP and PTP-MAL
4:30	Cathy Wylie	CALA	Is Proficiency Testing Enough to Ensure Quality Data? The Case for Accreditation
5:00	EXHIBITION VISIT		
6:00	Welcome reception at Marriott Fallsview Salon ABC **Sponsored by Bruker Corporation**		

Technical Session, Tuesday September 10, 2019

"Spectrometric Techniques 1"

Time	Presenter	Organization	Title
7:00 AM	Breakfast – Milestones One The Falls **Sponsored By Romquest Technologies Corp.**		
8:00	Dr. Ian D. Brindle	Brock University	Plenary Presentation; What We Can Learn From The Alchemists
8:45	Jayme E. Curet	Thermo Fisher Scientific	Determination of isotope ratios and fingerprints for geological studies using triple quadrupole ICP-MS
9:15	Dr. R. Bastian Georg	Agilent Technologies	Evaluating the Performance of Triple-Quad ICP-MS
9:45	COFFEE BREAK & EXHIBITION VISIT	**Laval Lab Inc.**	Oakes Foyer and Oakes North
10:30	Oliver Buettel	Analytik Jena	High Resolution Spectroscopy in Plasma and Flame – The Efficient Way to Reliable Results
11:00	Greg Gilleland	Agilent Technologies	Simultaneous Determination of Major and Trace Components in Spectra-rich Mining Materials using FACT Spectral Deconvolution
11:30	Stephen Duffin	IsoSpark Analytical Solutions	ED-XRF Analysis That Eliminate the 'Matrix Effects' in Mineral
12:00 PM	**Lunch – Milestones On The Falls** **Sponsored By IsoSpark Analytical Solutions**		

Technical Session, Tuesday September 10, 2019

"Spectrometric Techniques 2"

Time	Presenter	Organization	Title
1:15 PM	Stewart McIntyre	University of Western Ontario	User-Friendly Software for XRF Analysis of Geological and Metallurgical Samples
1:45	Oliver Buettel	Analytic Jena	Fluorine Analysis with solid AA® CS – A New Solution to an Old Challenge
2:15	Kevin French	Vertex Environmental	Passive, In-Situ Remediation of ARD Plumes – Bench-Scale Testing and Full-Scale Site Application Case Studies
2:45	COFFEE BREAK & EXHIBITION VISIT	**Laval Lab Inc.**	Oakes Foyer and Oakes North
3:30	Andrew Rams	PerkinElmer	Improvements in LA-ICP-MS analyses using features of the NexION 2000 ICP-MS
4:00	Stephen Duffin	IsoSpark Analytical Solutions	Development of DSOI (Dual Side-On Interface) for ICP-OES analysis offering Superior Sensitivity on Difficult Sample Matrices for Mineral Analysis
4:30	Andrew Toms	Elemental Scientific	The automation of laser ablation - The NWRAuto
5:00	EXHIBITION VISIT		
6:30	**Bus Departure at Lobby of Marriott On The Falls For Gala Dinner**		
7:00	**Gala Dinner & Trivia Night – Queen Victoria Place Restaurant**		

Technical Session, Wednesday September 11, 2019

"Sample Dissolution Techniques"

Time	Presenter	Organization	Title
7:00 AM	Breakfast – Milestones On The Falls **Sponsored Malvern Panalytical Technologies**		
8:00	Dr. Mariek E. Schmidt	Brock University	How Martian igneous rocks inform our understanding of the planet's interior
8:45	Pierre Pelchat	Geological Survey of Canada	Advances in bench chemistry using a short wavelength-IR sample digestion
9:15	Jose Varghese	SCP Science	Innovative look at High Temperature Block Digestions for the Mining Laboratory
9:45	COFFEE BREAK & EXHIBITION VISIT	**Canalytical**	Oakes Foyer and Oakes North
10:45	Benoit Bouchard	Katanax	Borate Fusion - Oxidation of Metals & Alloys
11:15	Dr. Matthew Leybourne	Queen's University	Comparative study of the ColdBlock Technologies Workstation against traditional methods for gold and base metals
12:00 PM	**CMA Awards Lunch – Hennepin Room (Lobby Level)** **Lunch Sponsored by SGS** **Best Technical Paper Sponsored by Scott Technologies Inc.** **Best Technical Paper Runner Up Sponsored by PerkinElmer** **Best Exhibition Award Sponsored by Neil Banerjee**		

Note: Ballots will be collected at 11:45am for Best Technical Paper and Best Exhibitor Award

Monday Plenary Presentation and Technical Abstracts

Monday September 9, 2019

1:00pm	**Plenary Presentation: Rock & Mineral Analysis, just like the Earth, is continually evolving**

Dr. Norman M. Halden, Department of Geological Sciences, University of Manitoba

The last 40 years has seen a proliferation of analytical techniques and instruments being applied to understanding the physical and chemical behavior of Earth materials. From early mass spectrometers borne of the nuclear bomb providing the technological underpinnings of how the Earth's crust varied in age, to bulk geochemical techniques helping delineate tectonic plates and domains, there has been an intimate interplay between geological theory and analytical methods of rocks and minerals. What may once have been the response of an element in isolation to some form of excitation in the physics laboratory has become the modern analytical instrument with a computer interface used to support a resource and environmental industry trying to keep humanity supplied with materials, and our Earth and Environment sustainable.

When an unknown material shows up in the laboratory today's student or researcher will have to decide whether they interrogating the material surface or its subsurface, work out if they have enough material or time, choose between a destructive or non-destructive techniques, determine whether they have sufficient sensitivity to detect what they think might be there, and maybe even if they have a budget to do the work.

Rocks and minerals have a tendency to "stay put" during analyses, on the other hand geofluids present a more active and dynamic medium that have a profound impact on the behaviour and composition of Earth materials. Often, we are left to read these impacts in retrospect as chemical and structural traces left behind in rocks and minerals. Perhaps this represents a interesting and challenging new frontier in research requiring the next round of methods development where we make our measurements in rocks and minerals closer to real time.

1:45pm	**Decision Rules For Multianalyte Tests**

Edgar F. Paski, Analytical Innovations

The ISO/IEC 17025:2017 Standard defines decision rule: "rule that describes how measurement uncertainty is accounted for when stating conformity with a specified requirement". Shewhart type control charts for central tendency usually employ one of the three common decision rules: Standard, WECO or Nelson. All three of these decision rules use 3 s (99.7% confidence level) from target value for rejection and 2 s (95% confidence level) from target value for warning.

For a single analyte assay like Cu by FAAS, the likelihood of these decision rules giving a Type I inference error (false positive) are 5 in 100 for a 2 s warning and 26 in 10,000 for a 3 s action limit. The risk of rejecting 1 measurement on a control sample for every 385 measurements on a control sample is an acceptable "cost of doing business" while maintaining good quality control over the assay process. Multianalyte tests such as metals by ICP-OES, 30 to over 50 elements are determined on a single solution injection. For an ICP-OES run for 40 elements, there would be at least one 3 s action limit failure for every ten control samples run, an unacceptable failure rate burden on the assay lab.

The new decision rules to be presented are applicable to multianalyte tests for any number of analytes, they reduce the Type I error to about that of a single element test while evaluating all analytes simultaneously and include trending.

2:15pm	**Efficient downstream processing of ore – New methods for monitoring XRD and statistical methods**

Dr. Uwe Konig, Malvern Panalytical

To cope with varying raw material qualities and increasing prices for energy a more frequent and accurate monitoring of the processing of ore became focus during downstream processing. Traditionally quality control in mining industries has relied on time consuming wet chemistry or the analysis of the elemental composition. The mineralogy of raw material and processed ore that defines the properties and behaviour

during concentration and smelting is often not frequently monitored. One fast method to analyse the mineralogical composition of ores, concentrates, sinter or pellets is X-ray diffraction, XRD. Recently statistical methods like similarity analysis or partial least square regression (PLSR) in combination with XRD raw data became more and more popular to handle large amount of data and to correlate process relevant parameters directly with an XRD measurement. PLSR can be used to correlate process parameters directly from the XRD pattern without investigating the mineral content. Hidden information present in the measurement but not determined with traditional methods can be used to improve the characterization of the analysed materials. Analysis within minutes compared to time and labour intense traditional physical and chemical methods as well as the additional information about phase composition enables efficient processing of ores and minimum use of energy. The practical use for the direct determination of chemical and physical process parameters will be illustrated on case studies.

2:45pm	**COFFEE BREAK & EXHIBITION VISIT** **Sponsored by IsoSpark Analytical Solutions**
3:30pm	**If You Spike Them, You Do Not Bleed – The Pros and Cons of Offline Internal Standard Addition**

Dr. Marcus Burnham, Geoscience Laboratories

An internal standard (IS) is a commonly added to sample solutions to allow for the correction of instrumental drift and/or matrix effects during analysis. Most instrument manufacturers and peripheral suppliers include on-line internal standard addition kits as part of their solution introduction systems and incorporate internal standard corrections into the instrument software. Although on-line addition of an internal standard has pronounced benefits for some analyses, it fails to correct for several significant processes that may affect samples during their preparation and analysis, in particular inaccuracies when making up to volume, evaporation of solution before or during analysis, and possible changes in the relative flow rates of sample and IS solutions during runs. In contrast, off-line internal standard addition, that is spiking with internal standard during solution preparation, is relatively insensitive to such process, leading to not only more robust analyses, but the potential for greater throughput and lower analytical costs. Using geoanalytical examples, a case will be made for the benefits of offline internal standard addition and its place in instruments and their software.

4:00pm	**Observations on Recent Data from CCRMP and PTP-MAL**

Maureen Leaver, Natural Resources Canada/CCRMP

Canadian Certified Reference Materials Project (CCRMP) receives a considerable amount of data from laboratories world-wide for the preparation of its certified reference materials. Observations on the data from an interlaboratory measurement program for a lead concentrate, CPB-3, versus the previous lead concentrate, CPB-2, released in 2008, will be discussed. Results from recent cycles of the Proficiency Testing Program – Mineral Analysis Laboratories (PTP-MAL) will also be presented.

4:30pm	**Is Proficiency Testing Enough to Ensure Quality Data? The Case for Accreditation.**

Cathy Wylie, CALA Inc.

Mining companies' laboratories analyse samples for a number of reasons including: ore samples to assess mineral bodies, "in-process" samples to monitor and control milling, smelting and refining operations; and environmental samples to meet government monitoring requirements and to assess the impact of the mining operation on the local environment. To help ensure they are producing quality data many laboratories routinely analyse certified reference materials and Proficiency Testing (PT) samples. The PT samples may be from Natural Resources Canada's Proficiency Testing Program for Mineral Analysis Laboratories (PTP-MAL), the Canadian Association for Laboratory Accreditation (CALA) PT program, or another source. Is this enough to ensure quality data?

CALA will present data from its PT programme that clearly shows that laboratories that are accredited to ISO/IEC 17025 General requirements for the competence of testing and calibration laboratories, consistently outperform laboratories that only participate in proficiency testing programs. Over a number of years, the performance of both groups of laboratories improved but the accredited labs continue to outperform the PT only labs. Other advantages of laboratory accreditation will also be discussed.

5:00pm	**EXHIBITION VISIT**
6:00pm	**Welcome Reception at Marriott Fallsview Salon ABC** **Sponsored by Bruker Corporation**

Tuesday Plenary Presentation and Technical Abstracts

Tuesday September 10, 2019

8:00am | Plenary Presentation; What We Can Learn From The Alchemists

Dr. Ian D. Brindle, Professor Emeritus of Chemistry, Brock University

"Theory guides, experiment decides": Izaak Maurits Kolthoff (1894–1993)

Despite the fact that alchemists and early chemists had no idea of the elements as we know them, they had a loose framework for a theory of chemical relationships. These pioneering analysts carefully recorded their observations and generated a body of empirical, anecdotal results that are recorded in allegorical terms. Close reading of their work provides valuable insights into the chemistry of elements such as gold, silver, and a number of base metals together with hints at assay methods. In this lecture, I will illustrate what ancient analysts learned and how their work can inform and improve current analytical investigations. For example, the determination of gold and silver in alloys benefits from a method that was first described in detail in 1920 by a chemist, William Branch Pollard, working in Cairo on archaeological materials from the Valley of the Kings in Egypt. The method that Pollard developed may, however, be based upon recipes developed in medieval times by the Persian assayers, such as the alchemists in the court of Haroun el Rashid of the 8th century (Abū Mūsā Jābir ibn Hayyān) and the 9th century (Muhammad ibn Zakariya al-Razi).

8:45am | Determination of isotope ratios and fingerprints for geological studies using triple quadrupole ICP-MS

Jame E. Curet, Thermo Fisher Scientific

Inductively coupled plasma mass spectrometry is an established technique for the quantitative assessment of trace elements, but especially metals, in all kind of sample matrices. However, not only can this technique allow to rapidly and reliably quantify a wide series of elements, also the determination of isotope ratios is possible. The isotopic composition can be used as a highly characteristic fingerprint for the unambiguous identification of a metal´s presence in a sample. Moreover, isotope ratios, when determined with sufficiently high enough precision, can provide valuable insights into the geochemical surrounding or history of e.g. a rock sample or byproducts of an ore.

Whereas most analytes are seriously affected by mainly polyatomic interferences, especially in the low to mid mass range, other interferences may occur and cause serious concern in higher mass ranges. Among these, isobaric overlaps need to be mentioned, such as for example 87Rb and 87Sr. However, to accurately determine the isotope ratio of 87Sr/88Sr, this overlap needs to be removed. Due to the small difference in mass between neutrons and protons, the required resolution to resolve an isobaric overlap, very high resolution settings are typically required, which cannot be achieved with mostly applied instruments such as single quadrupole or high resolution instruments, like double focusing sector field systems (with both single and multiple ion collectors).

Triple quadrupole-based instruments can effectively resolve a variety of different interferences using a combination of reactive gases to induce chemical reactions in the collision/reaction cell (CRC) and an additional mass filtration step before ions will enter the cell. This allows for effective removal of all types of interference commonly observed, as long as analyte and interference show different reactivity to the gases commonly used. These gases can be for example oxygen (O2) or ammonia (NH3), but also other gases such as nitrous oxide (N2O) or sulfurhexaflouride (SF6) have been described[1].

This presentation will show examples how triple quadrupole ICP-MS can effectively eliminate interferences, with special focus on the removal of isobaric interferences on key isotope systems relevant for geochemistry (87/88Sr, lead and hafnium isotope systems). The usability of different reactive gases and resolution settings will be compared to demonstrate that triple quadrupole ICP-MS instruments can in principle overcome the impact of isobaric overlaps and determine relevant isotope ratios with acceptable precision.

References:

1. Zack, T., et al., Chemical Geology (2016)

9:15am | Evaluating the Performance of Triple-Quad ICP-MS

Dr. Bastian Georg, Agilent Technologies

The release of the first triple-quadrupole ICP-MS by Agilent in 2012 marked a milestone in ICP-MS development. The MS/MS configuration of the Agilent triple-quadrupole ICP-MS platform is unique; it features two full-size high transmission quadrupole mass filters (QMFs), both of which are situated in dedicated high vacuum regions to yield high ion transmission and lowest abundance sensitivity. Both QMFs operate at <1u resolution, providing market leading sensitivity and unprecedented interference removal capabilities by fully harnessing the power of reactive gases and the exploitation of resulting product ions. The MS/MS configuration, with the reaction/collision cell between the two QMFs, enables mass-specific control over the ion composition entering the cell in the presence of reactive gases to prevent the formation of unwanted by-product ions. Reactive gases can be employed to overcome isobaric interferences that are well beyond the resolving power of available sector-field ICP-MS instruments. However, the performance of a triple-quad instrument not only relies on the requirement of both QMFs operating at unit mass resolution, but also on other factors such as abundance sensitivity.

Here we propose a few simple tests to support instrument performance evaluation processes and to unambiguously demonstrate triple-quadrupole performance. Once such test is the determination of mass-dependent and mass-independent sulphur isotopes, measured in MS/MS and O2 reaction mode.

9:45am **COFFE BREAK & EXHIBITION VISIT** **Sponsored by Laval Lab Inc.**

10:30am **High Resolution Spectroscopy in Plasma and Flame –The Efficient Way to Reliable Results**

Oliver Buettel, Analytik Jena

Geological samples, as well as intermediate and final products, are routinely analyzed for major and trace constituents. Analytical samples typically contain a high amount of dissolved solids. Matrix effects on analytical results are common and need to be compensated for. Spectral and non-spectral interferences are very common due to the complex sample composition, requiring a skilled operator to ensure correct results. Complex sample preparation is often required, which is time consuming and error prone. This poster uses different application examples to point out the advantages of High Resolution Spectroscopy for the analysis of complex samples in geology, mining and processing.

11:00am **Simultaneous Determination of Major and Trace Components in Spectra-rich Mining Materials using FACT Spectral Deconvolution**

Greg Gilleland, Agilent Technologies

Reliable determination of trace elements in mining materials can be challenging due to line-rich spectra of many of the major constituents in the ore materials. With FACT Spectral Deconvolution it is possible to overcome spectral interferences and resolve near spectral overlaps as close as 4 picometers. The FACT library allows for permanent storage of correction models and subsequent application in any worksheet.

11:30am **ED-XRF Analysis That Eliminate the 'Matrix Effects' in Mineral**

Stephen Duffin, IsoSpark Analytical Solutions

Elemental analysis is one of the most important investigative tools in geology, vital in mineral exploration, extraction process control and environmental studies. Energy Dispersive X-Ray Fluorescence (EDXRF) spectrometry provides a convenient, rapid method of analysis for rocks, exploration samples, minerals, ores, concentrates and tailings, usually with far less sample preparation than that required for other techniques.

So-called "matrix effects" are common in geological analysis by EDXRF, and if ignored can cause significant quantitative errors. Advanced EDXRF technology and sophisticated calibration techniques will be presented that minimize and compensate for matrix effects. This means that systems can now be pre-calibrated at the factory and will give accurate results, even on samples with widely differing matrices, making ED-XRF spectrometers exceptionally easy to set up and use. This talk illustrates the high quality of results obtainable with new state-of-the-art design with instruments using straightforward and well proven sample preparation techniques.

It is well known that the matrix can have a very significant effect on EDXRF results, so the analytical signal from the same concentration of a given element could be different in different matrices – for example in acidic, intermediate or igneous rocks. Geological samples often contain a wide range of elements at vastly differing concentrations, from major components to traces. This discussion will include ED-XRF instruments that can be used in the lab or be totally portable for field analysis.

12:00pm	**Lunch – Milestones On The Falls Sponsored by IsoSpark Analytical Solutions**
1:15pm	**User-Friendly Software for XRF Analysis of Geological and Metallurgical Samples**

Stuart McIntyre, University of Western Ontario

X ray fluorescence (XRF) has been widely used in mineral prospecting and processing communities as a rapid and reliable tool for a wide range of rock and mineral sections, powders and slurries. Synchrotron radiation-based XRF (SR-XRF) has the capacity for extending XRF detection sensitivity to trace levels of base, precious, and rare earth elements. Moreover, focused SR-XRF mapping enables microscopic imaging of such elements. However, previous SR-XRF analysis software has been complicated, unwieldy, and leaves too much of the detailed inspection of data to the human eye. We introduce a recently developed analytical software package that is designed to capture data from a variety of XRF and e-beam sources and to model all components of the spectrum. New users can become comfortable with the main program functions within an hour. The software also helps new users to avoid many of the most commonly made mistakes in spectral assignments. Reasonably acceptable quantitative measurements can be made using a simple model, as long as suitable reference materials are measured as part of the analysis procedure. A range of trace and minor elements in several CANMET and NIST reference materials have been analyzed in this way and the average accuracies fall within a factor of two of the reference values. The software is freely available from its website: www.peakaboo.org.

1:45pm	**Fluorine Analysis with solid AA® CS – A New Solution to an Old Challenge**

Oliver Buettel, Analytik Jena

Fluorine can have negative effects on processing, refining and final product quality, therefore is monitored as a quality parameter. No direct spectroscopic methods (e.g. AAS, ICP-OES/-MS) are available for total Fluorine. Traditional detection of Fluoride by Ion Selective Electrode or Ion Chromatography is species-selective, and severe matrix effects need to be accounted for, resulting in a high risk of error and laborious sample preparation. This poster demonstrates the fast and simple analysis of Total Fluorine by Direct Solid Sampling analysis in a variety of geological samples, intermediates, and products.

2:15pm	**Passive, In-Situ Remediation of ARD Plumes – Bench-Scale Testing and Full-Scale Site Application Case Studies**

Kevin French, Vertex Environmental

Acid rock drainage (ARD) is a common issue at mine sites where the rock contains sulfide minerals, such as pyrite. When exposed to air and water, oxidation of the sulfides generates acidity. The resulting leachate typically has a low pH and high concentrations of toxic metals. When mine tailings are situated in the vicinity of surface water bodies this poses an environmental risk to aquatic life and can result in a significant liability. The long-term generation of ARD from such sites requires an equally long-term solution.

Vertex specializes in the in-situ remediation of environmental contaminants. Recently we have seen more interest the treatment of dissolved-phase heavy metal plumes resulting from ARD and at other industrial sites, such as metal plating operations. In response to this increase in demand, Vertex has developed capabilities to assess the long-term performance of zero-valent iron (ZVI)-containing permeable reactive barriers (PRBs) to provide sustained, passive treatment of groundwater plumes containing heavy metals and to manage environmental risks.

This talk will present real-world case studies from two sites where we have recently designed and implemented remedial programs to address the ARD discharge of groundwater containing low pH and multiple heavy metals (arsenic, cadmium, zinc, etc.) to a salmon spawning creek and a former tannery site that had a plume of highly contaminated groundwater containing arsenic that was discharging to a river.

The case studies will include a presentation of site characteristics, remedial approach and post-remediation groundwater monitoring data demonstrating that remedial targets were achieved and maintained.

2:45pm	**COFFE BREAK & EXHIBITION VISIT Sponsored by Laval Lab Inc.**
3:30pm	**Improvements in LA-ICP-MS analyses using features of the NexION 2000 ICP-MS**

Andrew Rams, PerkinElmer

Imaging is becoming a routine tool for Laser Ablation Inductively Coupled Plasma Mass Spectrometry (LA-ICP-MS) in biology and geochemistry and recent developments have led to the capability of laser ablation systems to image at a higher rate to the extent that the sequential nature of some ICP-MS systems (e.g. quadrupole, sector field) combined with settling times can lead to unwanted effects such as aliasing and temporal offsetting. Some ICP-MS systems also suffer from limited practical dynamic range such that it becomes problematic to analyze matrix elements in the same imaging experiment as trace elements.
The NexION 2000 ICP-MS from PerkinElmer can address these issues in three ways: using short settling times to spend significantly more of the duty cycle actually measuring isotopes; allowing the user to set multiple sweeps per reading, which can greatly reduce elemental offsetting observed in the final images; and allowing the user to independently set the RPa and RPq quadrupole settings on a per-element basis so that the signal from matrix elements can be attenuated by orders of magnitude without affecting the duty cycle or settling times. Data and examples will be discussed.

4:00pm	**Development of DSOI (Dual Side-On Interface) for ICP-OES analysis offering Superior Sensitivity on Difficult Sample Matrices for Mineral Analysis**

Stephen Duffin, IsoSpark Analytical Solutions

Development of DSOI (Dual Side-On Interface) for ICP-OES analysis offering Superior Sensitivity on Difficult Sample Matrices

This talk will highlight a new technique for ICP-OES analysis with the introduction of a novel vertical torch with dual side-on interface (DSOI) plasma observation that enhances sensitivity by a factor of two. This new technique also enables high matrix compatibility and linearity. Without the need for a second plasma view measurement, DSO provides freedom from matrix interferences. Results will demonstrate that the new plasma interface doesn't suffer from the interface contamination that can adversely afflict conventional vertical-torch dual-view interfaces. Further studies will show that the new DSOI (dual side-on interface) offers significant improvement in determining trace elements concentrations and handling samples with challenging matrices such as high-salts, difficult environmental samples, geological and general mineral determination for a variety of sample types.

The details of DSOI technology will be discussed in detail in utilization of two optical interfaces that capture emitted light from both sides of a vertical plasma, with only a single extra reflection, thus yielding added sensitivity. In addition, it will be discussed how the inclusion of state-of-the-art, low noise linear array CMOS detectors benefit analysis by avoiding the blooming effect to allow even more accurate measurement of trace elements. This new development of DSOI will show dramatic improvement in overall ICP-OES analysis by offering a solution that will yield improved analysis and offer other cost reduction advantages.

4:30pm	**The automation of laser ablation - The NWRAuto**

Andrew Toms, Elemental Scientific

Recent advances in laser ablation system design and technology mean this analytical sampling technique can be incorporated into an on-line fully automated process stream for exploration analysis, as well as metallurgical quality/process control.
We will review the fundamentals of traditional laser ablation sampling and its limitations for high throughput analysis, and compare that with automation applications for fused disc XRF samples as well as from casting processes.

5:00pm	**EXHIBTION VISIT**
6:00pm	**Gala Dinner & Trivia Night, Queen Victoria Place Restaurant** **Thanks To Venture Niagara, Bereskin & Parr, and Ravine Vineyard Estate Winery**

Wednesday Plenary Presentation and Technical Abstracts

Wednesday September 12, 2018

8:00am — How Martian igneous rocks inform our understanding of the planet's interior

Dr. Mariek E. Schmidt, Department of Earth Sciences, Brock University

Martian basaltic rocks represent samples of the interior of the planet, and their elemental compositions reflects their mantle source composition at their time of extraction as well as later igneous processes that affected them. Basaltic shergottitic meteorites can be studied in extreme detail and provide information on relatively young products of the Martian mantle (as young as 173 ± 3Ma), but lack geologic context. Igneous rocks examined by rover missions in Gusev and Gale Craters represent a complementary dataset. These rocks are generally thought to be older (>3.5 Ga) and their geologic context is better understood because we know where on the planet they are derived. Together, the meteorites and landed datasets suggest that the Martian mantle is heterogeneous with respect to volatile elements (K). A limited range in oxygen fugacity implies that tectonic recycling of surface materials into the Martian interior is also limited.

8:45am — Advances in bench chemistry using a short wavelength-IR sample digestion

Pierre Pelchat, Geological Survey of Canada

The Geological Survey of Canada's Inorganic Geochemistry Research Laboratory (IGRL) has investigated the ((Cold Block™((digestion system for aqua regia (AR) and sequential dissolution (SD) environmental analyses. In a Cold Block digestion, atomic bonds in sample particles are attacked directly via the infrared radiation, rather than indirectly via the fluid medium as in hotplate or microwave digestions. For AR digestions (ISO11466.3, USEPA3050B), the Cold Block digestion: 1) greatly improved precision (from 12.9% to 1.3%) over both in-house and outsourced traditional AR digestions; 2) produced comparable recoveries to standard digestions; and 3) produced >60% time savings compared to standard AR digestions. Traditional Sequential Dissolution analyses aim to provide a sample's elemental distribution via a sequence of dissolutions that "operationally" isolate individual matrix components. The highly controlled and automated Cold Block system has tremendous scope for varying reaction conditions via the IR intensity, reaction time and fluid medium controls. Simple experiments that only varied IR intensity (i.e. using only the bond irradiation component) generated SD's that successively attacked increasingly stable bonds and appear to have effectively dissolved individual matrix components; meanwhile, the automation and control maintained high precision and accuracy. This new approach also produced substantial time savings over traditional sequential extraction schemes.

9:15am — Innovative look at High Temperature Block Digestions for the Mining Laboratory

Jose Varghese, SCP Science

This presentation discusses the merits of a high temperature graphite digestion block system with dedicated inserts for each of a variety of digestion vessels including Teflon vessels. The selection of vessels is determined by the acid matrix required to complete the digestion. The paper discusses the benefit of using the same sample vessel from beginning to end for the digestion as a weighing vessel, as the digestion vessel on the block and as a graduated cylinder for reconstituting the sample residue to a known volume. The sample is then serially diluted with an internal standard and made to volume for ICP-OES and ICP-MS analyses.

A unique off-line robotic dispensing system is also described as it provides a safe method of dispensing reagents like Hydrofluoric acid. The robotic system normalizes the samples after each of the aliquotting steps. The calibration standards are also prepared on the robotic system for both the ICP-OES and ICP-MS systems. Recovery results are included for a variety of certified mining samples.

9:45am	**COFFE BREAK & EXHIBITION VISIT** **Sponsored by Canalytical**
10:45am	**Borate Fusion – Oxidation of Metals and Alloys**

Benoit Bouchard

Solid sample preparation using borate fusion technique is now well established and used widely for typical fully oxidized samples such as cement, ceramic, catalyst, mineral ore, etc. Analysts use the benefit of this technique to obtain high quality results by X-Ray spectroscopy. The challenge in borate fusion is to process metallic (reduced) samples. It needs to be transformed into associated oxides to be compatible (soluble) in molten flux and also make sure to not induce irreversible damages to platinumware. The topic of this presentation is to demystify the different techniques of oxidation that can be used in fusion. Using oxidation can increase the complexity of fusion preparation, but it will always be worth it to obtain the quality results of a fused bead.

11:15am	**Comparative study of the ColdBlock Technologies Workstation against traditional methods for gold and base metals.**

Dr. Matthew Leybourne, Queen's University

ColdBlock™ Digestion Technology uses short-wave infrared radiation with an integrated cooling zone to digest geological and biological samples faster, at a fraction of the cost, than traditional techniques, while still producing accurate and reproducible results. This project, carried out in partnership with AMIRA and industry sponsors, was designed to compare traditional methods with ColdBlock™ for geological materials of interest to the mining industry. The project was carried out in two phases. The first phase involved the digestion of selected gold ore samples (both certified reference materials and company sponsor samples) from each sponsor using PbO Fire Assay and ColdBlock™ technology and comparing the recoveries. Phase two was carried out on base metal samples from 3 different sponsors comparing the recoveries obtained with ColdBlock™ with those obtained using a hot block. Phase 1 showed good correlations in gold results between the traditional fire assay method and the ColdBlock™ technology with R2 values ranging from 0.9045 to 1.000 for all five sponsors. For phase 2, the base metal samples showed good correlations between ColdBlock™ digestions and hot block digestion techniques with R2 values ranging from 0.9876 to 0.9993 for copper and 0.9717 to 0.9983 for iron for the three sponsors. For the base metals, the methods were not optimised for each ore type for this project. Optimisation of the method for a specific ore matrix would further improve the correlation. The return on investments carried out for the gold samples as well as for the base metal samples showed a great business case for the use of ColdBlock™ Technologies. For the use of ColdBlock™ technology to replace PbO Fire Assay the return on investment was recognised between day 1 and day 240 with $0.84M to $2.4M savings over 5 years, and for traditional digestions the return on investment was recognised between day 30 and day 60 with a savings of $0.81M to $6.77M savings over 5 years.

12:00pm	**CMA Awards Lunch – Hennepin Room** **Sponsored by SGS**

Social Program and Other Events

* Note: Event Tickets Required

*Wayne Gretzky Estates Tour and Social

Sunday 4:00 - 6:00 pm
Bus leaves at 4:00 pm from the lobby at the Marriott On The Falls

Welcome Reception

Monday 6:00 - 8:00 pm
Marriott Fallsview, Salon ABC, located across the street from the Marriott On The Falls
Cocktails and dinner will be provided

*Gala Banquet and Trivia Night

Tuesday 7:00 - 10:00 pm
Queen Victoria Place Restaurant
Bus leaves at 6:30 - 6:45 pm from the lobby at the Marriott On The Falls

*Niagara Parks VIP Tour

Wednesday 3:00 - 7:30 pm
Participants will meet lobby at 2:45 pm
Participants are asked to wear walking shoes

*Whirlpool Jet Boat Tour

Wednesday 3:00 - 5:00 pm
Participants will meet lobby at 2:45 pm

Trip to Fallsview Casino

Wednesday 7:00 pm
Participants will meet at 6:45 pm at lobby of the Marriott On The Falls
Informal evening. Participants will walk to the Fallsview Casino

*Automation Seminar

Thursday 8:00 - 11:00 am
Hennepin South, Marriott On The Falls

Organizing Committee

Honorary Chair	Dr. Ian Brindle	ibrindle@brocku.ca
Conference Chair	Nick Kuryluk	nkuryluk@coldblock.ca
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Social Programs Chair	Cassie Price	cprice2@brocku.ca
Technology Chair	Kirill Pereverzev	kpereverzev@coldblock.ca

Conference Schedule

Note:

- **Registration, exhibit hall, technical sessions, other meetings, breakfast and lunches, and bus departures all take place at Marriott On The Falls.**
- **Only the Welcome Reception takes place at Marriott Fallsview Salon ABC located across the street.**

Sunday, September 8, 2019	
9:15 am to 1:15 pm	Golf - Transportation departs 8:30am at Marriott On The Falls Lobby
2:00 pm to 6:00 pm	Registration - Marriot On The Falls Lobby
3:00 pm to 4:00 pm	Session Chair Debriefing - Marriot On The Falls Lobby
4:00 pm to 6:00 pm	Wayne Gretzky Estates Tour & Social - Bus departs 4:00pm at Marriott On The Falls
Monday, September 9, 2019	
7:00 am to 8:00 am	Breakfast - Milestones On The Falls
7:00 am to 11:45 am	Registration - Mezzanine Level
8:30 am to 1:00 pm	Exhibitor Set-up - Foyer and Oakes North
8:30 am to 11:30 pm	CALA Workshop - Oakes South
10:00 am to 10:30 am	Coffee Break and Exhibition Visit - Foyer and Oakes North
11:45 am to 12:45 pm	Lunch – Milestones On The Falls
1:00 pm to 5:30 pm	Exhibitors Open to Delegates - Foyer and Oakes North
1:00 pm to 5:00 pm	Afternoon Technical Session “Chemometrics” - Oakes South
2:45 pm to 3:30 pm	Coffee Break and Exhibition Visit - Foyer and Oakes North
5:00 pm to 6:00 pm	Natural Resources Canada Meeting - Ontario Room
6:00 pm to 7:30 pm	**Welcome Reception Cocktail Dinner - Marriott Fallsview Salon ABC (across the street)
Tuesday, September 10, 2019	
7:00 am to 8:00 am	Breakfast - Milestones On The Falls
8:00 am to 12:00 pm	Exhibitors Open to Delegates - Foyer and Oakes North
8:00 am to 12:00 pm	Morning Technical Session “Spectrometric Techniques 1” - Oakes South
9:45 am to 10:30 am	Coffee Break and Exhibition Visit - Foyer and Oakes North
12:00 pm to 1:00 pm	Lunch - Milestones On The Falls
1:00 pm to 5:30 pm	Exhibitors Open to Delegates - Foyer and Oakes North
1:15 pm to 5:00 pm	Afternoon Technical Session “Spectrometric Techniques 2” - Oakes South
2:45 pm to 3:30 pm	Coffee Break and Exhibition Visit - Foyer and Oakes North
6:30 pm to 6:45 pm	Bus Departures for CMA Gala at Lobby of Marriott
7:00 pm to 10:00 pm	CMA Gala Dinner and Trivia Night - Queen Victoria Place Restaurant
Wednesday, September 11, 2019	
7:00 am to 8:00 am	Breakfast - Milestones On The Falls
8:00 am to 10:45 am	Exhibitors Open to Delegates - Foyer and Oakes North
8:00 am to 11:45 am	Morning Technical Session “Sample Dissolution Techniques” - Oakes South
9:45 am to 10:45 am	Coffee Break and Exhibition Visit - Foyer and Oakes North
10:45 am to 2:00 pm	Exhibit Tear-Down
12:00 pm to 1:00 pm	CMA Awards Lunch - Hennepin North and South Room
1:15 pm to 2:15 pm	CMA Annual General Meeting - Oakes South
Thursday, September 12, 2019	
7:00 am to 8:00 am	Breakfast - Milestones On The Falls
8:00 am to 11:00 am	Automation Seminar - Hennepin South