

# Welcome to the 28<sup>th</sup> Annual Mid-Canada AOAC Day

Wednesday, June 21, 2017

**Victoria Inn and Conference Center  
1808 Wellington Avenue, Winnipeg, Manitoba**

**\*\*\*Registration Fee - \$30.00\*\*\***

**Registration begins at 8:00 a.m.**

## AOAC Day Highlights

- Laboratory Equipment/Supply Exposition
- Technical Presentations
- Annual General Meeting
- Keynote Address: **Dr. Sonya Havens**  
Chemist, IISD Experimental Lakes Area Inc.  
**"The Experimental Lakes Area: Whole ecosystem aquatic research since 1968"**
- Free training courses (with registration):
  - What can NMR do for the chemist? Introduction to experiments beyond 1D proton and carbon spectra  
*Presented by Bruker BioSpin*
  - USP requirements for metal analysis  
*Presented by Agilent Technologies*
  - Microwave sample digestion for USP 232-233 - *Presented by Agilent Technologies*
  - Agilent Ground breaking Innovations in GC - *Presented by Agilent Technologies*
  - Challenging chromatography and mass spectrometry applications and novel solutions  
*Presented by Agilent Technologies*
  - Single Cell ICPMS - *Presented by PerkinElmer*
  - Chemical Safety in the lab - *Presented by ThermoFisher Scientific*

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# Program at a Glance

TIME	EMBASSY B	EMBASSY C
8:00	REGISTRATION / COFFEE	
WORKSHOPS - Please sign attendance forms in sessions so certificates can be prepared.		
8:45 – 9:10	<b>Analysis of trimethylsilyl derivatives of cyanogenic glycosides from flaxseed (<i>Linum usitatissimum</i>) by GC-MS</b> <i>Tao Fan, Canadian Grain Commission</i>	
9:15 – 9:40	<b>An improved configuration of the organic-diffusive gradients in thin films passive sampler for polar organics in aquatic systems</b> <i>Kevin Stroski, University of Winnipeg</i>	
9:45 – 10:10	<b>SPE Mechanisms and QuEChERS</b> <i>Matt Clark, Chromatographic Specialties</i>	
10:15 – 10:45	COFFEE & SNACKS	
10:45 – 11:10	<b>Separate yourself from the Status Quo: Vanquish UHPLC</b> <i>Mark Netsch, ThermoFisher Scientific</i>	<b>WORKSHOP:</b>  <b>Chemical Safety in the Lab</b>  <i>Robyn Mills and Marcel Scratton, ThermoFisher Scientific</i>
11:15 – 11:40	<b>Open Access Mass Spectrometry for Metabolite Quantitation and Metabolomics Flux Analysis</b> <i>Brigitte Simons, SCIEX</i>	
11:30 – 1:00	LUNCH - KEYNOTE	
1:00 – 1:25	<b>How Sweet It Is! – Improving Carbohydrate Analysis</b> <i>Matt Boag, Waters</i>	<b>WORKSHOP:</b>  <b>Single Cell ICPMS</b>  <i>Ruth Merrifield, PerkinElmer</i>
1:30 – 1:55	<b>Compressing the workflow of Infrared Microscopy with intelligent automation</b> <i>Brian Wong, PerkinElmer</i>	
2:00 – 2:25	POSTER SESSION /COFFEE	
2:30 – 3:00	<b>Sample Prep for ICP Analysis</b> <i>Dan Alvarez, CEM Corporation</i>	<b>Intact Gluten Subunit Analysis by LC-MS</b> <i>Ray Bacala, Canadian Grain Commission</i>
3:00 – 3:25	<b>MiniWave Microwave Digestion, Applications and Overview</b> <i>Jose Varghese, SCP SCIENCE</i>	
3:30 – 4:00	<b>Ion Chromatography – Quick refresher on theory and application</b> <i>Jay Gandhi, Metrohm Canada</i>	
4:15	PRIZE DRAW	

# Program at a Glance

TIME	EMBASSY D	EMBASSY E
8:00	REGISTRATION / COFFEE	
8:30		<b>WORKSHOP:</b> <b>USP requirements for metal analysis</b>  <i>Presented by Agilent Technologies</i>
8:45 – 9:10	<b>What's New with Bruker in 2017?</b> <i>Dr. Richard K. Shoemake, Bruker BioSpin</i>	
9:15 – 9:40	Expanding the NMR palette: multinuclear magnetic resonance of glasses, coordination polymers and paramagnetic solids <i>Dr. Scott Kroeker, University of Manitoba</i>	
9:45 – 10:15	<b>Measuring the Microscopic Using Magnetic Resonance Imaging</b> <i>Dr. Melanie Martin, University of Winnipeg</i>	
10:15 – 10:45	COFFEE & SNACKS	
10:45 – 11:10	<b>A Highly Parallelized Bloch Simulator for Magnetic Resonance Imaging</b> <i>Michael Honke, University of Manitoba</i>	<b>WORKSHOP:</b> <b>Microwave sample digestion for USP 232-233</b>  <i>Presented by Agilent Technologies</i>
11:15 – 11:40	<b>NMR of partially ordered hydrocarbons in liquid crystals</b> <i>Dr. Adrian Weber, University of Winnipeg</i>	
11:45 – 1:00	LUNCH - KEYNOTE	
1:00	<b>WORKSHOP:</b> <b>What can NMR do for the chemist? Introduction to experiments beyond 1D proton and carbon spectra</b> <i>Nicole K. Kruse, Application Specialist Bruker BioSpin</i>	<b>WORKSHOP:</b> <b>Agilent Ground breaking Innovations in GC</b>  <i>Presented by Agilent Technologies</i>
1:30		
2:00 - 2:25	POSTER SESSION /COFFEE	
2:30	<b>WORKSHOP (continued):</b>  <b>What can NMR do for the chemist? Introduction to experiments beyond 1D proton and carbon spectra</b>  <i>Nicole K. Kruse, Application Specialist Bruker BioSpin</i>	<b>WORKSHOP:</b>  <b>Challenging chromatography and mass spectrometry applications and novel solutions</b>  <i>Presented by Agilent Technologies</i>
3:00		
3:30		
4:15	PRIZE DRAW	



# Keynote Address

## THE EXPERIMENTAL LAKES AREA: WHOLE ECOSYSTEM AQUATIC RESEARCH SINCE 1968

**Sonya Havens, Ph.D., Chemist**  
IISD Experimental Lakes Area Inc.

### About the speaker:

Dr. Sonya Havens specializes in environmental analytical chemistry and has worked as the Chemist at the IISD Experimental Lakes Area (IISD-ELA) since 2014. Her responsibilities include the management of the on-site laboratory at the IISD ELA research station in Northwestern Ontario, which supports the Long Term Ecological Research Program (LTER) and whole ecosystem experiments.

Prior to her employment at IISD-ELA, Sonya worked at Fisheries and Oceans Canada's Freshwater Institute as a recipient of a NSERC Visiting Fellowship. She received her doctorate in Environmental Chemistry and Technology at the University of Wisconsin – Madison in 2011 and a Master of Science in Environmental Engineering and Science from Clarkson University in 2007. Her doctorate research studied the transport of steroid hormones from confined animal farming operations and her master's investigated iron biogeochemistry in the Laurentian Great Lakes. Sonya's research has appeared in several peer-reviewed journals, including Environmental Toxicology and Chemistry, Journal of Environmental Quality, Journal of Agricultural Chemistry and Environment, Canadian Journal of Fisheries and Aquatic Sciences, and Limnology and Oceanography.



# Keynote Address

## THE EXPERIMENTAL LAKES AREA: WHOLE ECOSYSTEM AQUATIC RESEARCH SINCE 1968

**Sonya Havens, Ph.D., Chemist**  
IISD Experimental Lakes Area Inc.

### Abstract:

The Experimental Lakes Area (ELA) is an aquatic research facility that has operated since 1968 with the goal to understand the effects of human activities on freshwater and to find solutions to environmental problems caused by those activities. Since the transfer of the facility and ELA staff from Fisheries and Ocean's Canada to IISD, the IISD Experimental Lakes Area (IISD-ELA) has made important investments into education and outreach. The ELA is an exceptional natural laboratory located in a sparsely populated region of Northwestern Ontario, Canada, and comprised of 58 small lakes and their watersheds set aside for scientific research. By experimentally manipulating these lakes, scientists are able to examine how all aspects of the ecosystem, from the atmosphere to fish populations, respond to environmental disruptions. In addition to whole ecosystem experimentation, the IISD-ELA operates a Long-Term Ecological Research (LTER) program wherein meteorological, hydrological, water quality and fisheries data has been collected from several un-manipulated lakes and their watersheds since 1968. This data is one of the largest, most comprehensive data sets on freshwater in the world. Furthermore, these LTER lakes serve as "controls" for the whole ecosystem experiments to discern whether changes in the manipulated systems are a result of the manipulation or a product of natural variability. This unique research approach has influenced billion-dollar decisions of governments and industries and has generated cost-effective environmental policies, regulations and management, all to ensure the safety of our freshwater supplies. This talk will include some of the key historical experiments as well as the new large scale projects currently being conducted by IISD-ELA staff and collaborators.



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# Technical Workshops

## Advance registration not required!

[What can NMR do for the chemist? Introduction to experiments beyond 1D proton and carbon spectra](#)

**EMBASSY D 1:00 – 2:00**

**EMBASSY D 2:30 – 4:00**

Dr. Nicole K. Kruse, Application Specialist Bruker BioSpin

With the modern NMR hardware and software available today, many of the experiments that used to be considered complicated and un-necessary are now quite routine and extremely beneficial to the chemist. This workshop will present an introduction to the alphabet soup of NMR experiments and explain what they are, what information can be obtained from them, and when to use one over another.

Topics will include:

- 2D experiments commonly used for structure verification and elucidation such as COSY, TOCSY, HSQC, HMBC.
- Examination of NMR active nuclei that might be of interest to the inorganic chemist and important things to consider when running these experiments.
- Brief introduction to Magic Angle Spinning (HR-MAS and MAS) methods
- Quick look into the possibilities of triple resonance bio-molecular NMR.



## **Technical Workshops - Advance registration not required!**

### **USP requirements for metal analysis**

**EMBASSY E 8:30 – 10:15**

Presented By: Agilent Technologies

### **Microwave sample digestion for USP 232-233**

**EMBASSY E 10:45 – 11:15**

Presented By: Agilent Technologies

### **Agilent Ground breaking Innovations in GC**

**EMBASSY E 1:00 – 2:00**

Presented By: Agilent Technologies

### **Challenging chromatography and mass spectrometry applications and novel solutions**

**EMBASSY D 2:30 – 4:00**

Presented By: Agilent Technologies

### **Chemical Safety in the Lab**

**EMBASSY C 10:45 – 11:45**

Robyn Mills and Marcel Scratton, ThermoFisher Scientific



## Technical Workshops - Advance registration not required!

### Single Cell ICPMS

**EMBASSY C 1:00 – 2:00**

Ruth Merrifield, Field Application Scientist, PerkinElmer

Trend in Single Particle and Single Cell ICP-MS: From Particles Detection in Complex Matrices to Quantification of Particles Number and Metal Content in Individual Unicellular Organisms.

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# Abstracts

## Technical Presentations

### EMBASSY B

8:45 – 9:10

#### **Analysis of trimethylsilyl derivatives of cyanogenic glycosides from flaxseed (*Linum usitatissimum*) by GC-MS**

Tao Fan, Canadian Grain Commission

Tao Fan\* and Véronique J. Barthet\*‡

\*Canadian Grain Commission, Grain Research Laboratory,  
1404-303 Main St, Winnipeg, MB, Canada, R3C 3G8

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Email: [veronique.barthet@grainscanada.gc.ca](mailto:veronique.barthet@grainscanada.gc.ca)

The mass spectra of the trimethylsilyl ethers of linamarin, lotaustralin, Linustatin, and neolinustatin were obtained by GC-MS (full scan conditions). Their fragmentation patterns are discussed in detail. Exact-mass data from high-resolution measurements were used to support the pathway interpretations for each cyanogenic glycoside trimethylsilyl ether. For each compound, a series of ion fragments, some specific and some common, were identified and the fragmentation structures were elucidated under the used GC-MS full scan conditions. These results were needed to develop a database of cyanogenic glycoside derivatives for future GC-MS analysis. These mass spectra were also critical to further develop a qualitative and quantitative analysis of cyanogenic glycoside compounds by GC-MS and GC-MS/MS, using SIM and SRM modes.

9:15 - 9:40

#### **An improved configuration of the organic-diffusive gradients in thin films passive sampler for polar organics in aquatic systems**

Kevin Stroski, University of Winnipeg

K. Stroski, J.K. Challis, C.S. Wong

University of Winnipeg

Email: [k.stroski@gmail.com](mailto:k.stroski@gmail.com)

Previous literature has shown the utility of the diffusive gradients in thin film sampler for polar organics (o-DGT) as an effective passive sampler in aquatic environments. In this study, a new configuration with a polyacrylamide diffusive gel and Septra™ ZT sorbent (Phenomenex®) was developed and calibrated at multiple pH values. Linear uptake ( $r^2 > 0.9$ ) was observed at pH=5 for a suite of 31 pharmaceuticals and pesticides over 25 days; suitable for typical passive sampler deployments. The same experiment was performed at pH=8.5 which resulted in linear uptake ( $r^2 > 0.9$ ) for many of the same compounds. Calculated sampling rates for both experiments ranged from 3.5 (paroxetine, pH=8.5) to 14.8 mL/d (enrofloxacin, pH=5). Comparisons of the uptake rates between the two pH experiments generally agreed (10% average relative error), with only six compounds exhibiting marked reduction with pH (e.g. sulfonamide antibiotics). Sampling rates with polyacrylamide gel were slightly lower than that observed previously for o-DGT with agarose, given more restrictive pore sizes in the former. Samplers performed well in field evaluations conducted in a wastewater treatment plant and an impacted river system. This work suggests that the introduction of an outer polyacrylamide diffusive gel and Septra™-ZT binding gel makes for a more robust and cost effective sampler, compared to earlier designs.

9:45 – 10:10

#### **SPE Mechanisms and QuEChERS**

Matt Clark, Technical Supervisor, Chromatographic Specialties

QuEChERS (pronounced Catchers), an acronym for Quick, Easy, Cheap, Effective, Rugged and Safe, is a sample extraction and clean-up technique widely used for the analysis of multiple residues in hydrated agricultural products. QuEChERS significantly improves laboratory efficiency and throughput.

By combining the QuEChERS extraction technique with a variety of SPE retention mechanisms you can fine tune your extraction for the greatest overall speed and reliability from sample preparation through analysis.

10:45 – 11:10

### **Separate yourself from the Status Quo: Vanquish UHPLC**

*Mark Netsch, Technical Sales and Support Specialist, ThermoFisher Scientific*

Obtain more results with better separations and easier interaction simultaneously. Learn about how the state of the art improvements in UHPLC technology offers unparalleled performance for a broad range of analytical methods.

11:15-11:40

### **Open Access Mass Spectrometry for Metabolite Quantitation and Metabolomics Flux Analysis**

*Brigitte Simons, Technical Applications Specialist, SCIEX*

Mass spectrometry (MS), especially the high resolution accurate mass system such as Time-of-flight (TOF) mass spectrometer, is a great fit for such screening applications because the data generated from these systems provides structural information for every possible analyte. Most quantitative studies have focused on the measurement of steady-state metabolite levels where experimental variability can mask the true degree of metabolic regulation. Data independent technique applied to the measurement of the flux heavy isotopes in a metabolic pathway shows great potential to elucidate the regulation / kinetics of metabolic pathways. MDCK cells were cultured under sterile conditions and seeded onto 24 well plates. A control and  $^{13}\text{C}$  labeled time course were created. Time points were generated at 0,1,2,5,10 and 20 minutes. Controls were created by feeding normal media and labeled flux samples were fed media prepared with stable isotope labeled  $^{13}\text{C}_6$ -glucose. Targeted extraction and library driven search, comparison of sample and control as well as multivariate analysis were all used to find species of interest. Differences in the degree of kinetic flux were apparent between labeled controls and treatments that received pathway inhibitors.

1:00-1:25

### **How Sweet It Is! – Improving Carbohydrate Analysis**

*Matt Boag, Waters Chemistry Specialist for Central to Western Canada, Waters*

Carbohydrate analysis presents many different chromatographic challenges. The complexity of carbohydrates combined with their very polar nature makes quantitative assays very difficult. This presentation will provide an overview of the chemistry of this very important class of compounds. We will investigate the many chromatographic options available and introduce an innovative liquid chromatographic stationary phase that overcomes many of the problems associated with traditional carbohydrate columns and stationary phases. Advanced chromatographic particle technology of bridged ethyl hybrid stationary phases provides the necessary particle substrate needed for reproducible carbohydrate separation. The selectivity and column robustness of the BEH Amide column chemistry will be featured in this presentation with direct focus on applications dealing with carbohydrate analysis.

1:30-1:55

### **Compressing the workflow of Infrared Microscopy with intelligent automation**

*Brian Wong, PerkinElmer*

IR spectroscopy is the primary technique for chemical identification of macro samples. Traditionally, IR microscopes do not have the ease of use of FTIRs, thus preventing the routine adoption of IR microscopy within industry. I will discuss smart automation features that enhance problem solving capability and provide research performance for all users.

2:30-3:00

### **Sample Prep for ICP Analysis**

*Dan Alvarez, Sales representative, CEM Corporation*

Sample Prep is a bottleneck in any lab. CEM provides solutions to ease that bottleneck and make your lab more productive/profitable.

We will review systems to rapidly and safely perform acid digestions and solvent extractions.



3:00-3:25

### **MiniWave Microwave Digestion, Applications and Overview**

*Jose Varghese, Senior Technical Sales Representative, SCP SCIENCE*

The MiniWAVE Microwave System from SCP SCIENCE is a versatile and compact instrument. The underlying design concept is to provide an affordable but powerful microwave device that can be used for acid digestions, and/or extractions. The MiniWAVE is ideal for small labs, whether they be research or analytical labs with a limited workflow.

Here we will show several applications to demonstrate the versatility of the unit as in Extraction mode or Digestion mode. The use of quart vessels means that the costs of consumables are low as the quartz vessels can be used for the life of the unit.

3:30-4:00

### **Ion Chromatography – Quick refresher on theory and application**

*Jay Gandhi, Regulatory Affairs Manager, Metrohm Canada*

Ion chromatography (IC) is an analytical technique that has revolutionized analysis of inorganic and organic ions, and has changed analytical chemistry in dramatic ways during the past 30 years. Due to a strong environmental impact, metal ion determination and speciation have received significant attention in recent years. Acceptance of ion chromatography for anion analysis was very rapid, primarily because of lack of alternative methods that could quickly and accurately determine anions in a single analysis. However, the situation regarding the analysis of cations was quite different, as there are many fast and sensitive spectroscopic methods, as well as polarography and stripping voltammetry. This presentation will review applications of ion chromatography for the determination of inorganic anions, organic acids, cations of alkali, alkaline earth, ammonia, in various samples. We will also review advanced analytical techniques such as IC hyphenated with mass spectrometers.

## EMBASSY C

2:30-3:00

### **Intact Gluten Subunit Analysis by LC-MS**

*Ray Bacala, Canadian Grain Commission and University of Manitoba*

Gluten is a viscoelastic polymer comprised of glutenin subunits polymerized by intermolecular disulfide bonds. Gliadins interact non-covalently with the gluten polymer and modulate elastic behavior, providing extensibility to the polymer. Low and high molecular weight glutenin subunits were extracted from wheat (*Triticum aestivum* L.) flour and analyzed by high-resolution LC-ESI-MS. Intact proteins were obtained by charge state deconvolution and statistics were obtained from replicate injections. Mass accuracy and intermediate repeatability were better than 0.01% (<1 Da absolute) and 0.001%, respectively. Dilution series were analyzed and the area response was highly linear with 91.0% of observed proteins species having  $r^2 > 0.990$ .

## EMBASSY D

8:45 – 9:10

### **What's New with Bruker in 2017?**

*Richard K. Shoemaker, Ph.D., Technical Sales Representative, Bruker BioSpin*

In addition to the well-publicized Avance-Neo NMR Spectrometer Console, Bruker has released other innovative products, both in hardware and software, to better support the research efforts of our partners in the Scientific Community.

The key points, and advancements found in the new Avance-Neo NMR Spectrometer architecture will be presented, along with other innovative hardware and software technologies that will hopefully will provide innovative solutions for both NMR and EPR applications.

9:15 - 9:40

### **Expanding the NMR palette: multinuclear magnetic resonance of glasses, coordination polymers and paramagnetic solids**

*Dr. Scott Kroeker, University of Manitoba*

Advances in NMR instrumentation, methodology and computational algorithms have steadily expanded the range of materials to which NMR spectroscopy may be profitably applied.

I will present recent examples from my group illustrating how such analytical progress contributes to structural insights in glasses, disordered crystalline phases and paramagnetic solids. (1)  $^{71}\text{Ga}$  and  $^{31}\text{P}$  MAS NMR provide valuable information about the short-range structure in gallophosphate glasses which may be interpreted in terms of changes in bulk properties. (2) Observation of previously inaccessible nuclides such as  $^{139}\text{La}$ ,  $^{137}\text{Ba}$ ,  $^{67}\text{Zn}$  and  $^{73}\text{Ge}$  are combined with carefully benchmarked GIPAW calculations to provide information about cation and anion disordering in cyanide and cyanamide coordination polymers. (3) DFT calculations are used to disentangle complex NMR spectra of paramagnetic metal acetylacetonate complexes, highlighting the importance of electronic structure in dictating the enormous peak shifts observed for nuclei interacting with unpaired electron spins.

9:45 – 10:10

### **Measuring the Microscopic Using Magnetic Resonance Imaging**

*Dr. Melanie Martin, University of Winnipeg*

The measurement of brain axon diameter distributions is important in neuroscience, because axon diameter is directly proportional to nerve conduction velocity. Recent studies indicate possible changes in axon diameter distributions associated with diseases such as Alzheimer's disease, autism, diabetes, dyslexia, fetal alcohol spectrum disorders and schizophrenia. The methods currently available for measuring axon diameters are highly invasive, requiring sectioning of brain tissue for electron microscopy, and are limited due to fixation and cutting artifacts, the need to use post mortem tissue, and the use of only small tissue sample sizes.

Combining oscillating gradient spin-echo sequences (OGSE) with models for axon distributions allowed us to infer sizes of structures, similar to axons, in phantoms, more accurately than previously done. For instance,

capillary tubes were inferred to have diameters of  $184 \pm 25 \mu\text{m}$ . Methods to reduce imaging time while maintaining measurement precision will be discussed. For instance, reducing the number of diffusion gradient measurements made can shorten imaging time by a factor of 2.5 which results in a decrease in precision of 18%. This work provides experimental evidence for using OGSE to infer the size of small structures, and lays the foundation for inferring the size of tissue structures, such as axon diameters in samples using MRI.

10:45-11:10

### **A Highly Parallelized Block Simulator for Magnetic Resonance Imaging**

*Michael Honke, University of Winnipeg*

A full Maxwell-field, diffusion capable, MRI simulator is designed and implemented. The simulator starts with a generated sample and outputs a simulated MR image. The simulator supports any general MRI sequence followed by a full image reconstruction process. Gradient recalled echo (GRE) and pulse gradient spin echo (PGSE) sequences were implemented with sample results. The PGSE sequence had diffusion sensitizing gradients added and demonstrated on a standard cylindrical MRI phantom with non-zero diffusion coefficients.

The simulator was also shown to faithfully recreate real MRI artifacts, which allows for issues in sequences to be discovered. The entire process is programmed for a graphics processing unit (GPU) to keep run times short. Compared to the CPU, the GPU was able to obtain simulation times shorter by up to a factor of fifty. GPU specific and general optimizations were made to the simulator algorithms. Having demonstrated the successful generation of simulated images the presented simulator is now ready to be used for both MRI and NMR research. The simulator is of interest for low field MRI/NMR research when the presence of concomitant gradients becomes important. Additionally, the simulated effect of diffusion can be studied in both normal and low field regimes.

11:15 – 11:40

### **NMR of partially ordered hydrocarbons in liquid crystals**

*Dr. Adrian Weber, University of Winnipeg*

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# Abstracts – Poster Session

Posters may be viewed throughout the day in the Vendor Exhibit Hall. Authors will be present during the afternoon coffee break to answer questions.

Posters that have been presented at a previous conference may have been published in that conference's Proceedings and may be subject to Copyright. Please refer to the original conference Proceedings for proper citation of these works.

**P01: Understanding NMR spectra of Paramagnetic M(acac)<sub>x</sub> Complexes in the Solid**

Kirill Levin, Scott Kroeker

University of Manitoba

Corresponding author: umlevin7@myumanitoba.ca

**P02: TBA**

Arun Krishnamurthy, Jordan Perillo, Scott Kroeker

University of Manitoba

Corresponding author: krishna6@myumanitoba.ca

**P03: High resolution LC-ESI-MS of intact wheat high molecular weight glutenin subunits (HMW-GS) reveals unexpected heterogeneity**

Katherine Cordova, Ray Bacala, Dave Hatcher

Grain Research Laboratory, Canadian Grain

Commission

Corresponding author:

katherine.cordova@grainscanada.gc.ca

**Presented at: 65th ASMS Annual Conference on Mass Spectrometry and Allied Topics from June, 5-9, 2017**

**P04: Verifying sub-sampling and preparation of laboratory samples for the elemental analysis of grains**

Anja Richter, Debbie Salazar, Shannon Neumann, Sheryl Tittlemier

Grain Research Laboratory, Canadian Grain Commission

Corresponding author:

anja.richter@grainscanada.gc.ca

**Presented at: SCIX2016 from September 18-23, 2016**

**P05: Analysis of Canadian Wheat Varieties Low Molecular Weight Glutenin Subunits Relative to Gluten Strength: A Genotype x Environment Study (2017)**

Hatcher DW and Bacala R

**Proceedings of the 65th Meeting of the American Society for Mass Spectrometry (ASMS), June 5-8, Indiannapolis, Indiana, USA**

**P06: Evidence for Glycation/Glycosylation of Low Molecular Weight Gluten Polymer Subunits in Wheat Kernels (2017)**

Bacala R, Perreault H and Hatcher, DH

**Proceedings of the 65th Meeting of the American Society for Mass Spectrometry (ASMS), June 5-8, Indiannapolis, Indiana, USA**

**P07: TBA**



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Anja Richter .....	Member-at-Large	Edin Kurbegovic .....	Member-at-Large
Ayana Alipio .....	Member-at-Large		

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