



uOttawa

# Chemistry Connections

Fall 2019

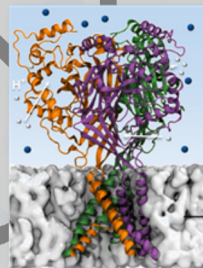
## *In this Issue*

Catch up with Emeritus Professor Tony Durst

Meet new Professor Maria Musgaard

A year in the life of our undergraduate and graduate students

The new STEM building for Chemistry and much more



Chemistry Connections  
The Annual Newsletter of the  
Department of Chemistry and  
Biomolecular Sciences  
University of Ottawa

# Message from the Chair

## Greetings, Alumni and Friends

It is a sincere pleasure to write to you in this inaugural issue of our department's annual newsletter. Whether you graduated recently or decades ago, there is a lot of exciting news to report about our department.

In the past decade we have further transformed ourselves into a leading research department on the national and international scenes. Our traditional strengths in catalysis, organic chemistry, materials chemistry, and biopharmaceutical sciences were further bolstered by the hiring of several research-active biochemists and chemical biologists to teach the large undergraduate biochemistry population which is now housed in our department. As a result, we are now known as the Department of Chemistry and Biomolecular Sciences.

Our most recent hire, Professor Maria Musgaard, is profiled in this newsletter. Maria comes to us from Denmark via Aarhus University and the University of Oxford. She holds the Canada Research Chair in Computational Biochemistry. Overall, our department is home to six Canada Research Chairs and five University Research Chairs.

In other news, in the fall of 2018, our department moved its headquarters to the new \$155M STEM building which was constructed in record time on the site of the old MacDonald building. STEM is also home to new undergraduate chemistry teaching laboratories and the chemistry help centre. Several professors also have offices in this building.

In 2017, the departmental Chair's Service Award for Research Excellence was established.



It is my pleasure to announce that the 2019 award went to the team of Sean Kirkwood, David Needham, and Michael Robb. These three individuals work tirelessly to address the facilities and infrastructure needs of our large department and indeed the entire Faculty of Science. Their efforts to ensure a smooth transition to the STEM building are greatly appreciated.

Last year, our very own Professor Louis Barriault became the Dean of the Faculty of Science and this year Professor André Beauchemin took on the role of Vice-Dean, Graduate Studies and Entrepreneurship. Along with long-serving Vice-Dean, Undergraduate Studies, Professor Alain St-Amant, it is clear that the direction and future of our Faculty is safe in the hands of chemists!

This newsletter highlights several other exciting developments which have occurred in our department over the past year or so. I hope you will enjoy reading about the fantastic achievements of our students, faculty, and staff.

Finally, I would like to thank Professor Tom Woo and Professor Francois-Xavier Campbell-Valois for their dedication to producing this first version of our newsletter. Our aim is to establish an annual tradition to stay in touch with our alumni and friends. I encourage you to drop by and visit the university and the department when you are in Ottawa. We are proud of our alumni and would love to hear from you! *—Professor David Bryce, Chair*

## Undergraduate Life

Greetings from the uOttawa Undergraduate Chemistry Club.

To start off another school year, uOttawa Chemistry Club continued their annual tradition of Lab Coat Tie-Dye! Students came out to the Marion Courtyard and ended up with a Fan-tie-dastic looking lab coats!



In October we celebrated Halloween by carving glow-in-the-dark pumpkins.



### Tea-Stressing

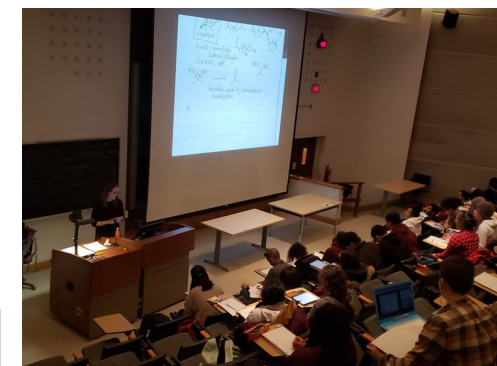
As exam season approached in November, the uOttawa Chemistry Club in collaboration with Environmental Science Student Association hosted an event to aid students TEAstress. Students were able to bring their own mug to grab comfort



drinks and snacks as they studied.

In January, we hosted a Graduate Studies Information session where we hosted Professor Al-Amin Dhirani to discuss post-graduation options at the University of Toronto.

Finally in April, the uOttawa Chemistry Club hosted an Organic Chemistry 1 final exam review session. Huge thanks to Samantha Rohe, the experienced teaching assistant who led the review session and assisted students to succeed in their final exam!



uOttawa Chemistry Club is excited about the upcoming 2019 - 2020 academic year, and we will continue our traditions of hosting the Lab Coat Tie-Dye event and chemistry review sessions. For more information, we encourage you to follow us on Instagram @uochem.



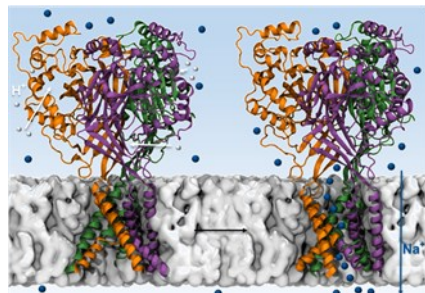
Maria Musgaard

## Meet our Faculty

Research Chair in Computational Biochemistry. Dr. Musgaard has a background in medicinal chemistry with BSc, MSc and PhD degrees from the Chemistry Department at Aarhus University, Denmark, and she spent her post-doctoral years at the Biochemistry Department at the University of Oxford, UK. She has worked in the field of computational biochemistry since her bachelor's degree in 2006.

From the very beginning of her research career, Dr. Musgaard has been working at the crossroads of different domains and has nurtured collaborations with experimental biochemists and structural biologists. Chemical signals at one side of a cellular membrane can be converted into an ion flux across the membrane through opening of a ligand-gated ion channel. The Musgaard Lab aims to understand how specific ligand-gated ion channels function, e.g., how binding of their activators open the ion channels, how the proteins interact with the membrane and how ion channel function is modulated by mutations. One target, the Ryanodine receptor is the largest known ligand-gated ion channel, and yet single mutations are sufficient to cause cardiac arrhythmias leading to sudden deaths in young individuals. The hope is to obtain a detailed understanding of the molecular mechanisms underlying the function of these ion channels,

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A ligand gated ion channel (colors) inserted in the lipid membrane (grey).

There have been many "firsts" in the past year for Professor Maria Musgaard who joined the department in August 2018. Indeed, Dr. Musgaard took on her first independent academic position, launched a lab, taught a full course and survived a Canadian winter for the first time!

Dr. Musgaard now heads her computational biochemistry lab that focuses on understanding the coupling between structure and function of proteins. Using input models based on protein structures, computational methods allow the study of the predicted dynamics of a protein with high resolution in both space and time simultaneously; information which cannot be obtained from wet-lab experiments. Thus, one can for example observe the structural transitions involved in opening and closing of a protein pore.

Since arriving at uOttawa, Dr. Musgaard has received a grant from the Canada Foundation for Innovation to fund high-performance computing facilities required to simulate the motion of complex proteins composed of hundreds of thousands of atoms. She has also received a grant from NSERC to fund a number of graduate students. Moreover, in May 2019, Dr. Musgaard was named a Tier 2 Canada

which would provide explanations for basic ion channel physiology and support drug design projects targeting these channels.

In addition to her research, Dr. Musgaard is teaching the second year *Introduction to Biochemistry* course. The course sparked an interest in protein structure for many undergraduates, and several of them have been volunteering in Dr. Musgaard's lab and have helped in the initiation of several new projects. For the 2019 fall semester, the lab is welcoming its first graduate student, two honours students and other undergraduate students to be trained on cutting-edge computer methods for biochemistry. This promises exciting times in the Musgaard lab.

## CGBSA: Year in Review



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<https://uottawacgsa.wordpress.com>

Greetings from the uOttawa Chemistry and Biomolecular Graduate Student Association (CBGSA)! We're excited to share stories from our events during these past few semesters.

The CBGSA is a student-run organization that was created to develop and enhance communication and cooperation amongst graduate students in the Department of Chemistry and Biomolecular Sciences at uOttawa. The organization is led by an executive team who work closely with the Chemistry department and graduate students to create social and educational events that are inclusive and fun.

Every May, our graduate students are invited to elect a new executive team for the year. This past May, we were excited to welcome our new executive team: Montserrat Zidan, President; Andre Costisella, Vice-President; Avery Morris, Treasurer; Jacky Deng, Secretary; Myriam Carle, Coffee Club Coordinator; Martin Hebert, Kelsey Fournier, and Spencer Short, Grill Crew; and Filipe Matos Lima, Union Repre-

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sentative. Welcome to the team, everyone!

In October 2018, we had our annual Halloween pumpkin-carving contest. Each lab group presented their spookiest pumpkin, and a winner was chosen by a panel of judges.



Our biggest summer event was our inaugural Chemistry Olympics. Participants organized into teams of four and tackled a series of events that challenged their chemistry skills, teamwork, and ability to find a sweet team costume.

After the Olympics, the Olympians went to the famous bar *Father & Sons* to celebrate a successful and competitive event, and the inaugural winners of the Olympics were presented with the Alchemist's Chalice.



To kick-off the new year, we have a bunch of events planned that will cater to both new and returning graduate students. First, we continued our Coffee Club tradition which occurs every second Tuesday of each month. At Coffee Club, graduate students and mingle with Profs over coffee and treats! Second, we have our annual Fall Mixer coming up! Every semester we host a social mixer open to graduate students and faculty from the department at local bar. The mixers are free and often come with discounted drinks or drink tickets. Third, we're selling CBGSA swag! If you want to rock a

cozy CBGSA hoodie or t-shirt this year, email us [here](#). It's been a great year for the CBGSA! On behalf of this year's executive team, we look forward to serving our graduate student body with more fun and educational events that will further strengthen our community.—by *Jacky Deng*



## Rain Forest Vine Yields Anti-Anxiety Natural Product



John Arnason, Zul Merali and Tony

Shawna Mackinnon's (Ph.D. 1995) interest in Central American natural products initiated the Durst (Chemistry)/Arnason (Biology) partnership which coupled with Costa Rican botanists, Luis Poveda and Pablo Sanchez, (Universidad Nacional; UNA) has continued for twenty eight years. The group has published over thirty papers and trained many graduate and undergraduate students in chemistry and biology.

It often targeted unstudied plants with the goal of discovering new phytochemicals with interesting properties such as *Souroubea sympetala*. This is a relatively rare neo-tropical vine belonging to the Marcgraviaceae family growing in Costa Rica's Eastern Lowlands. Zul Merali, (Psychology), who had an office close to John Arnason in the Vanier building, offered to test extracts of plant material brought back from

Costa Rica for their potential to reduce anxiety using the gold standard "Elevated Maze" and "Fear Potentiated Startle tests." One month later, he reported the "calmest rats in Ottawa." Thus began a twenty year journey resulting in the founding of Souroubea Botanicals Inc. and the marketing of Zentrol™, an anti-anxiety treatment for dogs composed of Souroubea plant material from Costa Rica and bark shed by Ontario sycamore (*Platanus occidentalis*) trees, including a very large specimen growing on Queen Elizabeth Drive opposite to the STEM building. Souroubea has teamed with a group of campesinos (peasant farmers) in Costa Rica and developed a two hectare plantation to grow this vine so that sourcing plant material would not deplete its natural population.

Evalaoni Puniani (Durst, PhD) carried out the phytochemistry of *S. sympetala* and identified six triterpenes, three plant sterols and one fatty acid as major components. Together with Chris Cayer, (Arnason, MSc) they found that the triterpene, betulinic acid, was responsible for the anti-anxiety activity. Martha Mullally (Arnason, PhD) showed the compound acted on the GABA receptor similar to valium but without unwanted side effects.

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Ana Francis Carballo (Durst, PhD) investigated other Souroubea genus members including *Souroubea gilgii* and showed this plant had essentially the same phytochemical profile as *S. sympetala*. Martha Mullally and Chris Cayer



*S. sympetala* leaves and fruit

were also able to show that betulinic acid lowered stress hormone cortisol levels in rats and in trout. Trevor Mogg (Durst, MSc) prepared over thirty analogs of betulinic acid some of which yielded superior reduction in cortisol levels.

The group has obtained US and Canadian patents describing *Souroubea* plant extracts and the combined *Souroubea* and *Platanus* plant materials for treating anxiety in animals and humans, as well as betulinic acid and derivatives for reducing cortisol levels in stressed animals.

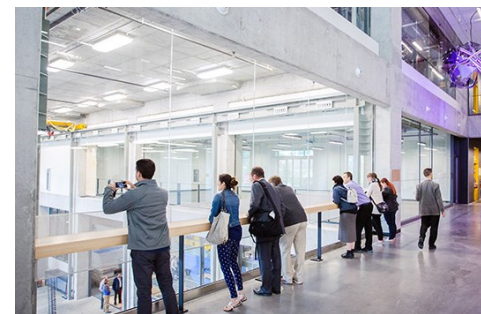
Souroubea Botanicals Inc. (SBI) is carrying out human safety trials on an extract of the same two plants. A major impetus for carrying out the human safety trials was the observation that the extracts gave promising results in an animal model designed to mimic post traumatic stress (PTS). Based on animal experiments and dog clinical trials already reported, we expect the extract will prove to be safe. When this will be demonstrated, SBI plans to approach governmental agencies for help in setting a Phase II efficacy trial focusing on PTS treatment for veterans.

## The STEM Building

On September 20, 2018 the University officially opened the new Science, Technology, Engineering and Mathematics (STEM) complex at the site of the old *MacDonald* and *CUBE* buildings. You heard right, the old 'Physics' building built in the mid-1960s and 'the CUBE' built in 1950 as a temporary structure, were demolished to make way for the new 29,000 m<sup>2</sup> com-



plex, now uOttawa's largest building. The \$155 million complex, shared by the Faculties of Science and Engineering, was funded by the Federal Post-Secondary Institutions Strategic Investment Fund, the province of Ontario, and the University of Ottawa. The building includes open-concept labs, 3D scanning and printing facilities, and an entrepreneurship hub. STEM also houses a brand new undergraduate chemistry lab for 2nd year Physical Chemistry, 3rd year inorganic and 4th year materials chemistry courses. The department's main office is now housed in the STEM building, along with the research labs and offices of about nine of our Faculty.



# 2018-2019 Departmental Highlights

## Awards

Professor **Tito Scaiano** won the 2019 Canadian Light Source TK Sham Award in Materials Chemistry from the Canadian Society of Chemistry, which is given to an individual who has made a distinguished contribution to materials chemistry both in terms of research and mentoring while working in Canada. [link](#)

Professor **Roberto Chica** won the 2019 Melanie O'Neill Young Investigator Award in Biological Chemistry from the Canadian Society of Chemistry. This award is presented to a scientist working in Canada who has made a distinguished contribution to biological chemistry who has received their Ph.D. no more than 12 years prior to nomination. [link](#)

Professor Roberto Chica was also awarded the 2019 Young Investigator Award from the Biophysical Society of Canada. [link](#)

Professor **Christopher Boddy** won the 2019 IntelliSyn RD Research Excellence Award, from the Canadian Society of Chemistry, which is given to a scientist residing in Canada who has made a distinguished contribution to medicinally relevant organic or biophysical chemistry. [link](#)

Professor **Stephen Newman** won the CNC-IUPAC Travel Award to attend the 20th IUPAC International Symposium on Organometallic Chemistry Directed Towards Organic Synthesis (OMCOS) in Heidelberg, Germany.

Professors **Derek Pratt** (pictured above right) and **Maxim Berezovski** received a Friedrich Wilhelm Bessel Research Award from the Alexander von Humboldt Foundation. Each year 20



scientists and scholars from around the world are recognized for their outstanding research with this prize, which is valued at 45,000 euros.

Professor **John Pezacki** was named a Fellow of the Royal Society of Chemistry of the United Kingdom. John was also awarded a prestigious Invitational Fellowship for Research in Japan offered by the Japanese Society for the Promotion of Sciences (JSPS).



*It runs in the family.* The Faculty of Science and The Society of Chemical Industry plaque for the highest standing in the honours bachelor in Chemistry was awarded to **Aidan Pezacki**.

Aidan is the son of our colleagues John Pezacki and Natalie Goto.

Professor **Alison Flynn** was named the inaugural Associate Editor for Chemistry Education research of the Canadian Journal of Chemistry. Alison was also recently accepted as a member of the Global Young Academy. [link](#)

Dr. **Gwen Bailey** from the Fogg lab was awarded a Alice Wilson award by the Royal Society of Canada. The award is given yearly to three women of outstanding academic qualifications in the Arts and Humanities, Social Sciences or Science. Gwen was also awarded the 2018 PhD thesis award from the Canadian Society of Chemistry's



Inorganic Division and is currently working as an NSERC postdoctoral fellow in the Agapie group at Caltech.

Dr. **Aron Broom**, who was a post-doctoral fellow with Professor Roberto Chica was awarded one of five 2018 John Charles Polanyi Prizes from the Government of the Province of Ontario. This award recognizes researchers in the early stages of their career. He has since joined ProteinQure inc.

## Funding, Discoveries, Innovations and Entrepreneurship

Professor **Deryn Fogg**, co-appointed at the University of Bergen, won a prestigious \$2M "blue-sky" award from the Research Council of Norway. The proposal, entitled "Water-tolerant catalysis: Boosting chemical biology, medicine, and sustainable chemical manufacturing", includes as collaborators Chris Boddy of our department, as well as Merck and Bristol-Myers Squibb.

Professor **Robert Ben** was one of eight researchers to be awarded funding from Glyconet Canada for his proposal "Ice Recrystallization Inhibitors for Improved Cryopreservation". The ice recrystallization inhibitors developed by the Ben lab improve cryopreservation outcomes of tissues and enable emerging cellular therapies by permitting the safe storage of cells and tissue. The grant is valued at \$232,942 and was the largest of the grants awarded this year.

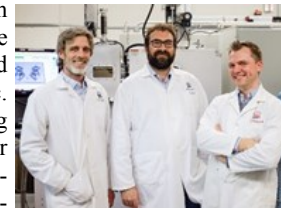
The **Pratt Lab's** paper "The antioxidant activity of polysulfides: it's radical!" published in *Chemical Science* was featured in the Royal Society of Chemistry journal *Chemistry World*. They

# 2018-2019 Departmental Highlights

found that common polysulfide antioxidant additives used in many petroleum products work by way of a radical mechanism rather than an ionic mechanism, contrary to long held wisdom. They have filed a patent application jointly with Infi-neum Corp. based on this discovery. [link](#)

The **Bryce lab** discovered that halogen bonding can be used to improve the performance of molecular machines in their paper "Halogen bonding as a supramolecular dynamics catalyst" published in *Nature Communications*. [link](#)

Professors Cory Harris (Biology), **Adam Shuhendler** (Chemistry), and Benoit Lessard (Engineering)- from left to right in the picture- launched Ekidna Sensing Inc. based on the design of a miniature sensor for on the spot detection of cannabinoids reported this year in the journal ACS Sensors. This study is also the work of Ph.D. student Zacharie Comeau.



Professor **Natalie Goto** was awarded a 2019 NSERC Discovery Accelerator Supplement award valued at \$120,000. This award is designed to provide a substantial and timely additional funding to maximize the impact of outstanding research programs.

Professor **Tom Woo** and PhD student **Peter Boyd** used high throughput computational methods to design advanced materials *in silico* for CO<sub>2</sub> capture. The materials were made and tested by experimental collaborators in Switzerland. Their paper "Data driven design and synthesis of metal-organic frameworks for wet flue gas CO<sub>2</sub> capture" by Boyd *et al.* published in the journal *Nature*.

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2018-2019

## Departmental Highlights

Professors **Comie daCosta** (Chemistry), **Roberto Chica** (Chemistry) and Maia Fraser (Math) were awarded a grant from the prestigious New Frontier Research fund to explore the potential of ligand-gated ion channels as cell-based therapies. These have the potential to transform the treatment of diseases such as diabetes by replacing conventional treatments.

In May, our department hosted the **2019 edition of the annual graduate research event for the Ottawa-Carleton Chemistry Institute (OCCI)**. A plenary lecture by uOttawa's Prof. Chris Boddy ended the formal sessions, and we closed with a celebratory mixer at the grad student café, Café Nostalgica. The turnout was super, with 110 attendees and 41 talks in a total of four sessions. The student presentations were excellent with the first place award going to Jacky Deng and second place awards going to: Yijue Xu, Vanessa Susevski, Eric Skrotzki, and Daniel do Nascimento.



Organizing Committee of the 2019 OCCI day

The 4<sup>th</sup> annual **Chemical and Synthetic Biology Day** hosted by the groups of Professors Chris Boddy and John Pezacki, was held on October 18 in D'Iorio hall. Members of the department focusing on Biomolecular Sciences attended keynote lectures by speakers from

academia and the private sector as well as presentations by our graduate students. Awards for the best student presentation were presented to Johnathon Emlaw, and Noreen Ahmed. Awards were also given for Poster Presentations to Eric Gates, Kaitlyn Margison, and André Paquette.



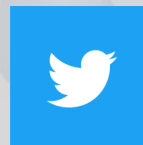
Prof. John Pezacki, Johnathon Emlaw (awardee) and Prof. Christopher Boddy

### Upcoming Visiting Speakers

- Nov. 20, 2019 Denis Giguère - Université Laval
  - Nov. 27, 2019 Seth B. Herzon - Yale University  
*(Gilead Lecture)*
  - Dec. 11, 2019 Derek Bowie - McGill University
  - Dec. 18, 2019 Paolo Melchiorre - Institut Català d'Investigació Química, Spain
  - Jan. 15, 2020 David Nagib - Ohio State University  
*(Fagnou lecture)*
  - Feb. 10, 2020 Gabriel Menard - UC Santa Barbara
  - Mar. 11, 2020 Garry Hanan - Université de Montréal
  - Mar. 25, 2020 Frank Glorius - Münster University
  - Apr. 1, 2020 Suzanne Bart - Purdue University
  - Apr. 15, 2020 Aaron Rossini - Iowa State University
  - Apr. 29, 2020 Ellen Yeziarsky - Miami University
- For more details about our visiting speaker program including the time and place of talks click [here](#).

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