

The

# EXCHANGER

Chemical and Biological Engineering Spring 2019

STUDENTS:  
The Core of  
What We Do



THE UNIVERSITY OF BRITISH COLUMBIA

# MESSAGE FROM THE DEPARTMENT HEAD



The present issue of The Exchanger features highlights from the Department of Chemical and Biological Engineering during 2018. It includes awards, list of distinguished seminars, new faculty and staff and research programs. You will also have the opportunity to read reports from the various student groups and from our unique 3rd year field trips to industry settings. The Exchanger also includes the names of the students who graduated from the Department in the May and November 2018 convocations.

During 2018, the Department's two undergraduate degree programs (BASC in Chemical Engineering; BASc Chemical and Biological Engineering) renewed their accredited status for an additional six years, which is the best outcome possible from the accreditation review. During 2018, the Department also underwent a successful external review.

One of my most memorable events during 2018 was the 25th year reunion of the Class of '93 on May 19. This was a class I taught back in the early 90's. Alumni from as far as Singapore attended the reunion and shared wonderful memories from their UBC years. On behalf of all of us at UBC, we thank the Class of '93 for their generous donation in support of our 3rd year student field trips.

Professor Taghipour's research in his photochemical engineering laboratory is featured this year. Dr. Taghipour's work focuses on solar energy, water purification and sensor development. His research has had significant impact through breakthrough water purification technology that has led to the establishment of Acuva Technologies.

During 2018 we initiated a project to renew our undergraduate curriculum starting with the 2nd year. The changes introduce students to the design process earlier and improve experiential learning in laboratories while strengthening their understanding of sciences foundational to the discipline. In addition, the Department received financial support from the University through a Teaching Learning Enhancement Fund (TLEF) to evaluate student outcomes and to ensure impactful curriculum redesign.

On June 30, 2019 my term as Head of the Department ends. It has been a privilege to serve the Department, the Faculty and the University for the past 10 years as Head. I am grateful for all the support from our faculty, staff, students, the Industry Advisory Council and the Dean's office over my years leading the department. I am confident that the Department is very strong and is poised to continue on an upward trajectory with innovative and renewed curricula and with faculty conducting leading edge research advancing disciplinary knowledge and having high, positive impact in BC, Canada and the world.

**Dr. Peter Englezos**, P.Eng, FCAE  
Professor and Head  
Department of Chemical and  
Biological Engineering

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## On the cover

Cover Photo: The Chemical and Biological Engineering Department 4th year Capstone students on Design and Innovation Day in the CHBE atrium.

Photo Credit: Tony Wu

# PHOTOCHEMICAL ENGINEERING LABORATORY

Dr. Fariborz Taghipour

The focus of our research group is the experimental study and computational modeling of photochemical systems, with applications to energy and environmental engineering. Specific research areas include the following:

1. advancement of next generation water and air purifiers operating with UV-LED and UV microplasma
2. development of new chemical-sensor and bio-sensor technologies based on photo-activated semiconductors
3. synthesis of photocatalysts for artificial photosynthesis and the generation of solar fuels.

The broad impact of these research programs is evident from their role in applying emerging technological opportunities to important energy and environmental issues.

## PHOTOREACTORS FOR WATER PURIFICATION

The point-of-use (POU) water purification market is undergoing a major transition due to unprecedented growth in demand, resulting from higher awareness and economic growth, particularly in developing countries. This massive growth has not been accompanied by corresponding development of new technologies and products, and this deficiency has created a technological gap. We address this gap by developing modular systems that eliminate microbial and chemical contaminants, operate at low power, and function with little to no maintenance required. When a continuous supply of electricity is available, several technologies for POU water treatment are possible. However, rural communities, especially in developing countries, often lack continuous access to electricity and are at the greatest risk of exposure to unsafe water supplies. We address this shortcoming by developing a new generation of ultraviolet (UV) reactors that operate using UV-LEDs and UV microplasma, as well as electrochemical cell based water treatment systems, which can be battery or solar-cell operated, using renewable energy.

UV-LED capable of emitting high-energy photons at short UV wavelengths is a new technological field that has recently seen rapid improvements and novel possible applications. These include the development of small-scale UV photoreactors and photocatalytic reactors for the inactivation of microorganisms and degradation of micro-pollutants. However, the development of efficient and cost-effective UV-LED reactors is a very complicated task, requiring extensive knowledge of photoreactor design, hydrodynamics, optics, microbiological kinetics, and solid-state optoelectronics. We study the fundamentals of UV-LED for water treatment and its application in the development of novel UV reactors. We currently focus on investigating the impact of certain distinctive features of UV-LED, which has resulted in much more efficient methods of water purification. Furthermore, we simulate, design, and fabricate original UV-LED and UV microplasma reactor prototypes to identify the capabilities of these emerging technologies for water purification and their new potential applications (Figure 1). Our innovative UV-LED reactor technologies have resulted in several patents, which have been filed internationally and have led to the formation of a company to develop and commercialize UV-LED reactors for water treatment.

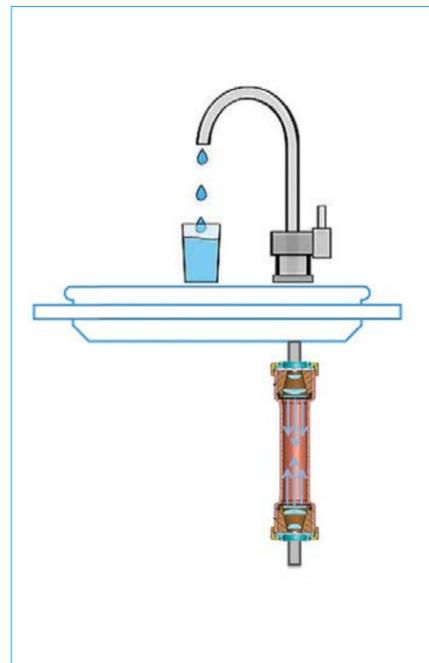


FIGURE 1.

**The concept of UV-LED photoreactor for point-of-use (POU) water treatment:** The proprietary technology developed in our group provides precise control of optics, hydrodynamics, and kinetics to deliver an intense beam of UV for powerful water treatment.

## PHOTO-ACTIVATED CHEMICAL SENSORS AND BIO SENSORS

UV photons can be applied as the activation source of photo-activated sensing materials for biological agent detection or for gas and liquid detection. This is significant, particularly for detecting and monitoring hazardous chemical components in industrial and urban settings and monitoring the presence or concentration of biological analytes. Our group is currently developing photo-activated, semiconductor-based chemical sensors and biosensors and is in the process of exploring several new design concepts to integrate the sensors into wearable devices.

The growing impact of airborne pollutants on human health and occupational safety has intensified the demand for sensors to monitor hazardous gases. We have developed a new generation of exquisitely sensitive gas sensors based on UV-LED activated semiconductor composites, where the electrochemical properties of the sensing material are significantly enhanced

by tailoring the material composition and structure. We synthesized atomic-scale nanoporous composite materials decorated with metallic nanoparticles with tailored carrier transport mechanism activated by UV-LEDs (Figure 2). This activation results in the formation of photo-generated charges that initiate oxidation and reduction reactions with target gas species. The sensors are highly sensitive and are responsive to a variety of gas species (including CO, CO<sub>2</sub>, H<sub>2</sub>S, NO<sub>2</sub>, and volatile organic compounds (VOCs)) with accuracy, and they can be manufactured at low costs. These advantages make them ideal for applications such as the detection and control of leaks and decontamination in confined spaces and closed rooms and the monitoring of atmospheric pollution in urban settings. In addition, our sensors enable real-time measurements of air quality, which currently can take several hours for some gases, and will address many of the limitations of the current semiconductor-based sensor technologies, including low stability.

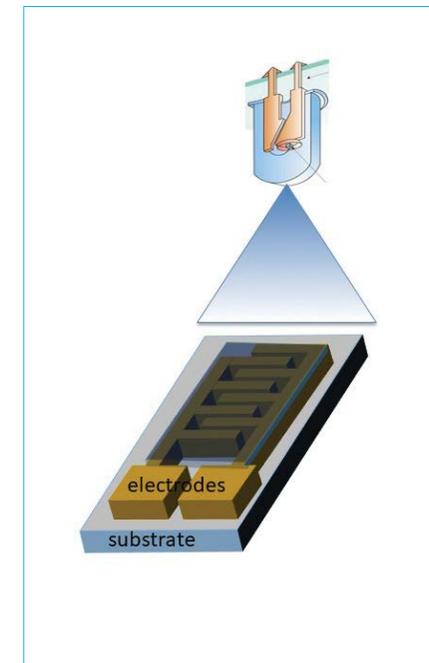


FIGURE 2.

**The concept of UV-LED activated gas sensor:** Engineered sensing material, activated by UV-LED, leads to the formation of photo-generated charges that initiate reactions with target gas species, resulting in electrical signals for the detection and measuring of chemical pollutants.

## ARTIFICIAL PHOTOSYNTHESIS AND SOLAR FUELS

Solar energy is by far the largest usable renewable energy resource, providing more energy to the Earth in one hour than all of the energy consumed by humans in a year. Currently, harvesting solar energy in the form of fuels is expensive, and although it can be argued that we cannot afford to use it, the argument could be made that in the future, we cannot afford not to use it. If solar energy is to be used as a major primary energy source, it must be captured, converted, and stored. One of the most promising methods of solar energy conversion and storage is through the chemical bonds of energy carriers such as hydrogen or light hydrocarbons. Hydrogen produced from solar energy conversion would be available not only for use as a recyclable reactant in fuel cells but also as a raw material for the production of other fuels such as methanol, utilizing existing technologies, while light hydrocarbons produced from CO<sub>2</sub> reduction can be directly used in much of the current infrastructure.

The strategic challenge faced by scientists and engineers is to develop new materials and processes to enable solar fuel to be sufficiently inexpensive to penetrate global energy markets. Our research focuses on the development of a novel, integrated, solar-activated photocatalyst concept and photoreactor design for solar fuel generation. This approach is envisioned as a new type of solar panel that uses solar energy to directly split water into oxygen and hydrogen fuel (Figure 3) or reduce carbon dioxide to hydrocarbon fuels, instead of generating electricity. We synthesized micro/nanostructured solar-activated photocatalysts immobilized on support-structured materials with high electron mobilities. This combination improves light absorption and charge separation, resulting in high photocatalytic activities and enables the use of inexpensive Earth-abundant materials. The photocatalyst structures are decorated with appropriate co-catalyst nanoparticles, which act as reaction sites for the high-rate evolution of solar fuels.

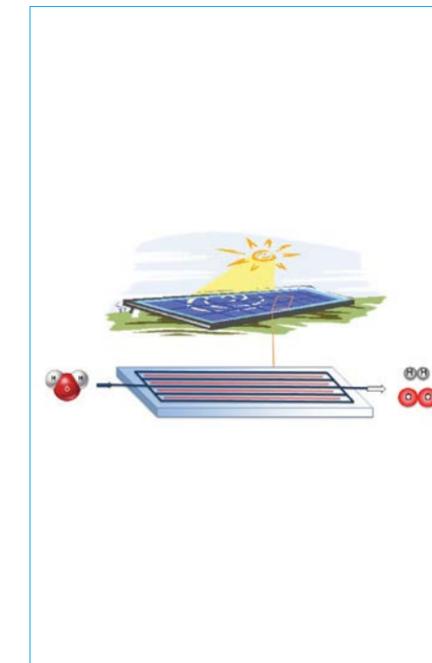


FIGURE 3.

**The concept of solar photocatalytic water splitting hydrogen generation:** The activation of photocatalyst by solar energy leads to the formation of photo-generated electrons and holes, which can split water to hydrogen and oxygen or reduce CO<sub>2</sub> to hydrocarbon fuels.

We expect our projects to lead to the advancement of knowledge and to result in the development of new technologies and products; and the students trained during the projects to become highly qualified to lead world-class research and development activities. ■

# NEW FACULTY

## DR. EMILY D. CRANSTON



Dr. Emily D. Cranston is an Associate Professor in the Departments of Wood Science and Chemical and Biological Engineering at UBC and holds the President's Excellence Research Chair in Forest Bio-products. She was previously an Associate Professor in Chemical Engineering at McMaster University (2011-2018) and held the Canada Research Chair in Bio-Based Nanomaterials (Tier 2). Her research focuses on sustainable nanocomposites and hybrid materials from

nanocellulose and bio-based polymers. She received her Honours BSc (2001) and PhD (2008) in Chemistry from McGill University. The study of value-added products from cellulose took her to Stockholm, Sweden as a post-doctoral fellow at KTH Royal Institute of Technology before she returned to Canada in 2011. Cranston's work has had a significant impact on a broad scientific community as evidenced by her H-index of 29, 4 patents and 81 peer-reviewed publications with over 3300 citations; this includes papers in *Chemical Society Reviews*, *Materials Today*, *Advanced Materials* and *Nano Letters*. She has been invited to give over 80 presentations at universities, conferences and companies around the world.

Dr. Cranston has trained 75 students and post-docs over the past 8 years which has led to 126 conference oral presentations and 102 poster presentations. Her work has been highlighted in *The Globe & Mail* Newspaper, *Canadian Chemical News* (ACCN), the *American Chemical Society's* (ACS) *Chemical & Engineering News*, and on the cover of the journals *Advanced Materials*, *Langmuir*, *Chemistry of Materials*, and *Nanoscale*. Cranston currently sits on the editorial board for *ACCN the Canadian Chemical News*, *ACS Central Science*, *ACS Macro Letters*, and the *Nordic Pulp & Paper Research Journal* and is active in Nanocellulose Standards Development with TAPPI, ISO and CSA. She is the vice-chair of the TAPPI Nano Division and has co-organized the annual conference over the past five years. Cranston is the recipient of the 2018 Kavli Emerging Leader in Chemistry Lectureship Award from the ACS, the 2017 KINGFA Young Investigator's Award from the ACS Cellulose and Renewable Materials Division, the 2015 Early Researcher Award from the province of Ontario, and was named by *Industrial & Engineering Chemistry Research* journal as a member of the 2018 Class of Influential Researchers.

## DR. YANKAI CAO



Dr. Yankai Cao is an Assistant Professor in the Department of Chemical & Biological Engineering. Dr. Cao's research focuses on the design and implementation of large-scale local and global optimization algorithms to solve problems that arise in diverse decision-making paradigms such as machine learning, stochastic optimization, optimal control, and complex networks. His algorithms combine mathematical techniques and emerging high-performance

computing hardware (e.g., multi-core CPUs, GPUs, and computing clusters) to achieve computational scalability. His goal is also to make these developments accessible to academic and industrial users by implementing algorithms on easy-to-use and extensible software libraries. Furthermore, Dr. Cao has applied the algorithms and tools to help collaborators address engineering and scientific questions that arise in diverse application domains including conflict resolution in energy system design, robust control of crystallization systems, predictive control of wind turbines, power management in large networks, and image classification for contaminant detection.

Dr. Cao earned his Ph.D. in Chemical Engineering from Purdue University and his Bachelor of Science in Biological Engineering from Zhejiang University. During his Ph.D. study, he interned at Argonne National Laboratory, United Airlines, and Air Products & Chemicals. Before joining UBC, he was a research associate at the University of Wisconsin-Madison.

# AWARD RECIPIENTS

## RECIPIENT:

### DR. LOUISE CREAGH



Photo Credit: Martin Dee

## AWARD:

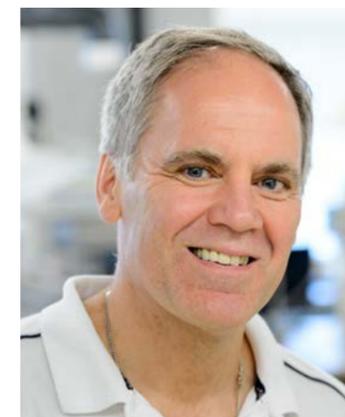
### UBC APPLIED SCIENCE DEAN'S AWARD FOR EXCELLENCE IN SERVICE

Dr. Louise Creagh, Senior Instructor in the Department of Chemical and Biological Engineering received a 2018 **Dean's Award for Excellence in Service**. Louise was nominated by APSC faculty, staff and students for improving "their workplace's productivity, quality of service or morale" and "a consistently high quality of work that is beyond what is normally required for their position".

Louise was acknowledged for her many years of student advisement, which she has approached with deep care for students' needs, her commitment to assist them prepare to deal with their curriculum and other challenges, and for her many contributions across the educational enterprise in the department and in Michael Smith Laboratories, where she has a cross appointment. As Associate Head for Undergraduate studies, she has guided the department's shared vision with strength, understanding, clarity of thought and excellent knowledge of university policies. A member of the committee preparing the department's CEAB documents, she is now in charge of implementation of the graduate attributes improvement process. Her sound knowledge of chemical and biological engineering is a wonderful resource to facilitate these ongoing discussions.

## RECIPIENT:

### DR. DAVID WILKINSON



## AWARDS:

### UBC KILLAM RESEARCH PRIZE AWARD

CHBE faculty member David Wilkinson, received the **UBC Killam Research Prize** in recognition of his "outstanding research and scholarly contributions."

Since 1986, the Annual Killam Research prize has been awarded to exceptional full-time UBC researchers who have held their university appointments for at least three years. Nominations are made by faculty colleagues. David received the award from UBC President Santa Ono in a ceremony on April 17th, 2018.

### OLD BRETONIAN LIFETIME ACHIEVEMENT AWARD

David Wilkinson, Class of '71, attended Brentwood College as a day student for five formative years. The **Old Bretonian Lifetime Achievement Award** honours his achievements including representing Canada on the Canadian National Rowing Team until 1980 and his distinguished research, engineering and leadership career.

David has held leadership and executive roles with Moli Energy and Ballard Power Systems. He holds a Tier 1 Canada Research Chair and has provided leadership roles in academia and industry with organizations such as the UBC Clean Energy Centre, the National Research Council, the Canadian Hydrogen and Fuel Cells Association and the Pacific Institute for Climate Solutions. He recently co-founded Mangrove Water Technologies. David has over 80 issued patents and over 185 refereed publications, as well as book chapters and edited books.

David is a Fellow of the Engineering Institute of Canada, The Canadian Academy of Engineering, the Chemical Institute of Canada and the Royal Society of Canada.

## RECIPIENT:

**DR. CHARLES HAYNES**

## AWARD:

**FELLOW OF THE CANADIAN ACADEMY OF ENGINEERING**

Dr. Charles Haynes is an internationally recognized authority on downstream processing of biologic therapeutics at manufacturing scales. His field-defining research has included the invention of numerous technologies that have gained widespread industrial use, including the Fractogel® chromatography media, now used in the manufacturing of over 20 life-saving FDA-approved protein therapeutics. His appointment as a Tier-1 Canada Research Chair in 2000 has further enabled his outstanding mentoring of academic and industry leaders in his field, and his role as Founding Director of UBC's Bio-Products Institute is providing crucial innovations and technologies needed to grow Canada's emerging bio-based products industries.

Cited from Canadian Academy of Engineering  
<https://www.cae-acg.ca/directory/#/action/Listing/value/934/searchID/46998/cid/1498/id/2201/Haynes%2c-Charles>

## RECIPIENT:

**ADJUNCT PROFESSOR DR. SHAHAB SOKHANSANJ**

## AWARD:

**ARUN S. MUJUMDAR MEDAL IN DRYING SCIENCE**

Dr. Shahab Sokhansanj, P.Eng. received the inaugural **Arun S. Mujumdar Medal in Drying Science** at the 21st International Drying Symposium (IDS 2018) held from September 11 to 14, 2018 in Valencia, Spain. The Medal and the accompanying inscription mark Dr. Sokhansanj's outstanding R&D in drying and a distinguished mentorship of researchers who are contributing to progress in drying technologies. Over 300 attendees from 40 countries participated in the Symposium.

Dr. Arun Mujumdar of McGill University founded the first International Drying Symposium in 1978 in Montreal. The Symposium has held its biennial meeting since then in 14 countries. The Medal for Excellence in Drying Science commemorates a half century of Professor Arun Mujumdar's un-interrupted contribution to the promotion of science and engineering worldwide.

## RECIPIENT:

**EMERITUS PROFESSOR RICHARD KEREKES**

## AWARD:

**INDUCTION TO PAPER INDUSTRY INTERNATIONAL HALL OF FAME**

Dr. Richard Kerekes, Emeritus Professor in UBC's Chemical and Biological Engineering Department, was inducted into the **Paper Industry International Hall of Fame** in Appleton, Wisconsin on October 4, 2018. The award was granted in recognition of his preeminent academic and research contributions to the paper industry.

Founded in 1992, the Paper International Hall of Fame (PIHF) has honored and recognized 135 giants of the paper industry from around the world whose accomplishments have truly revolutionized civilization. A plaque bearing each inductee's likeness and a video highlighting the contributions by each of them to the paper industry are permanently housed in the PIHF, which is the only one of its kind in the world and was created to foster a greater understanding of the paper industry — its values, heritage, and influence on our quality of life.

## RECIPIENT:

**DR. HEATHER TRAJANO**

Photo credit: Martin Dee

## PROGRESS THROUGH THE RANKS:

**PROMOTION TO ASSOCIATE PROFESSOR**

Dr. Heather Trajano was promoted to the rank of Associate Professor. Rising demand for chemicals and fuels coupled with the need to reduce greenhouse-gas emissions has made the production of these products from plants, biomass, a priority. Heather studies the fundamentals of recovering sugars from biomass and the catalytic conversion of those sugars into chemicals. These biomass-derived chemicals are a sustainable alternative to traditional petrochemicals. She also studies the recovery and purification of specialty compounds from biomass for use in fragrances, vitamins and pharmaceuticals. Heather uses fundamental knowledge of these processes to improve and commercialize biomass-conversion technologies. These technologies contribute to reinvigorating Canada's forestry industry, create jobs in nearby rural communities and contribute to Canada's efforts to lead the low-carbon economy transformation.

Heather earned her B.Sc. in Chemical Engineering-Cooperative Program with Distinction at the University of Alberta; she completed her Ph.D. at the University of California Riverside. Heather joined UBC as an Assistant Professor in 2012 immediately after completing her PhD. She has been acknowledged for her excellence in teaching by CHBE students and has been a recipient of the CHBE Teaching Award.

# FACULTY AWARDS

In 2018, two of our professors were awarded Tier 1 Canada Research Chairs.



## CHARLES HAYNES

### TIER 1 CANADA RESEARCH CHAIR IN INTERFACIAL BIOTECHNOLOGY

While we may look to biotechnology to make progress in medical therapies, crop varieties, advanced materials and methods for cleaning up toxic wastes, researchers must first look to new tools and techniques that will be essential to accomplish this progress. In fact, what has already been accomplished is largely the result of sophisticated new instrumentation necessary to manipulate large organic molecules, acquire biochemical information from genes, and culture tissues and organs.

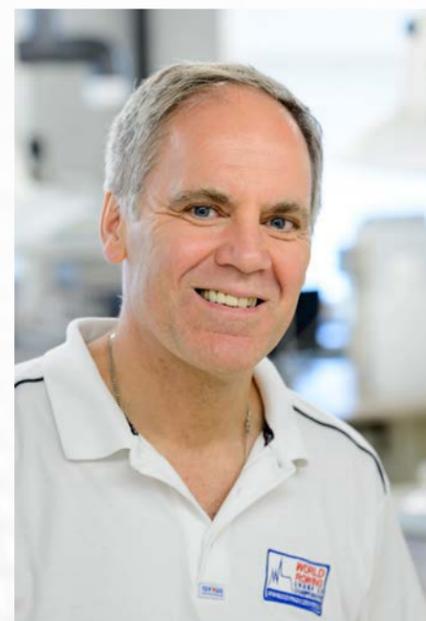
Such instrumentation benefits from an improved understanding of how molecules behave on surfaces that have been designed to promote certain chemical interactions. These surfaces make it possible to construct biosensors or diagnostic detectors for isolating sensitive biological products, which can then be processed without contamination or fouling.

Charles Haynes has been among those who have developed such systems. He introduced a chromatographic approach to separating biomolecules on the basis of size, which has now become standard in the bioprocessing industry. More recently his work has focused on developing novel micro-arrays that employ peptide nucleic acids to interact with DNA, obtaining information about genes much more quickly and efficiently.

As holder of the Canada Research Chair in Interfacial Biotechnology, Dr. Haynes will explore the molecular basis of such interactions. He will then apply this fundamental knowledge to the design of natural or synthetic surfaces that will make it possible to analyze complex biosystems at the molecular level, innovations that will prove to be crucial to the development of the entire field of biotechnology.

Cited from Government of Canada

<http://www.chairs-chaires.gc.ca/chairholders-titulaires/profile-eng.aspx?profileid=215>



## DAVID WILKINSON

### TIER 1 CANADA RESEARCH CHAIR IN CLEAN ENERGY AND ELECTROCHEMICAL TECHNOLOGIES

Dr. David P. Wilkinson, Canada Research Chair in Clean Energy and Electrochemical Technologies, is studying how to “green” existing processes for producing energy and water, and introducing innovative, implementable solutions. His research is at the intersection of water treatment, carbon dioxide conversion and mitigation, and the production of chemicals and energy.

Electrochemical technologies could offer much-needed long-term solutions to energy and resource sustainability with minimal environmental impact. Significant opportunities exist for using electrochemical materials and technologies in different applications, including transportation, energy storage and conversion, water treatment, and the implementation of renewables and grid management.

Wilkinson and his research team are focusing on electrochemical and photochemical devices, electrochemical energy conversion and storage materials, and processes to create clean and sustainable energy and water. Their aim is to advance electrochemical devices, such as batteries, capacitors, fuel cells and electrolyzers, as well as develop functional materials at different length scales, such as nanostructured catalysts.

Wilkinson’s research will lead to sustainable solutions that can compete with existing technologies both economically and functionally. It also has significant potential to provide solutions to the global energy and water challenges facing our world today.

Cited from Government of Canada

<http://www.chairs-chaires.gc.ca/chairholders-titulaires/profile-eng.aspx?profileid=1306>

# NEW STAFF

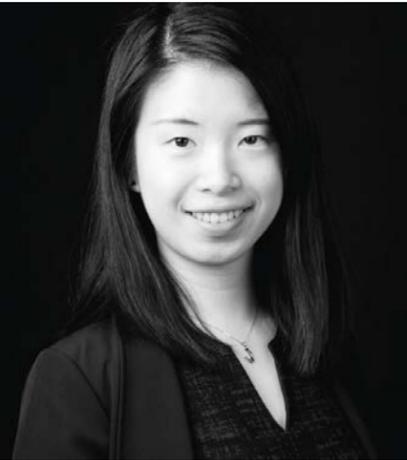
## KRISTI CHOW

Kristi was born and raised in the beautiful and bustling city of Richmond, British Columbia. She graduated with a BA in Health Sciences from Simon Fraser University in 2015 and has been the Graduate Student Coordinator since May of 2018. Prior to joining UBC, Kristi worked at a fitness company as an office administrator and worked as a receptionist throughout her time as an undergraduate. She hopes to help students with a smile, and use her previous experiences to contribute to the department. In her spare time Kristi enjoys trying new foods and has an interest in health.



## BRITTANY JI

Brittany joined the Department of Chemical and Biological Engineering (CHBE) as Student Services Manager in July 2018. She brings over four years of program administration experience from her previous position as Program Administrator of the Clean Energy Engineering program at UBC. She loves learning and growing as a person, and is looking forward to working with her dedicated colleagues, and continuously providing high quality service to both the undergraduate and graduate communities at CHBE. As a wellbeing liaison of the department, Brittany hopes to promote the balance between academic success and wellbeing. She has a Master's degree from University of Washington and a Bachelor's degree from the University of British Columbia. In 2018, she received her Project Management Professional certification. During her spare time, Brittany enjoys art, music and good food. She has also been a Guzheng player for more than 20 years.



## CIANNE MCKINNON

Joining the Department in early September 2018, Cianne is the Assistant to the Head. Bringing experience from a variety of other administration roles (and a short stint on a Welsh sheep farm), she is excited to contribute to the department with as many spreadsheets and to-do lists as she's allowed. As a current UBC student working on her BA in English, Cianne spends her time away from the office studying, reading stuffy novels, and writing papers. On the rare day she's not studying or working, you can find her experimenting in the kitchen or playing far too many video games.



# STAFF ANNIVERSARIES — LORI TANAKA AND AMBER LEE

## LORI TANAKA

Lori Tanaka, Undergraduate Student Coordinator, celebrated 30 years with UBC in 2018! Lori joined Chemical Engineering in 1988 as a secretary and has witnessed changes including Department changes from Chemical Engineering to Chemical and BioResource Engineering in 1996 and then to Chemical & Biological Engineering in 2000.

Lori is the first staff person most students encounter and she is invaluable in providing assistance and support to the undergraduate student programs. Lori responds to an infinite number of student questions and also supports faculty in their delivery of courses. In 1988 the incoming second year undergraduate class was about 30 students, peaking in 2017 with 132 second year students. In her 30 years with the Department, Lori has supported more than 1000 undergraduate students during her career. Lori received a 2017 Department Excellence in Service Award for her dedication to our students.

## AMBER LEE

Amber Lee, Financial Clerk, celebrated 25 years with UBC in 2018! Amber joined UBC in 1993 as a clerk with Faculty of Applied Science and subsequently had clerical and secretary roles with Facilities & Capital Planning and then with Building Operations. She joined Chemical Engineering in 2001 as a clerk. Since 2008, Amber has been a financial specialist providing financial support services to faculty researchers and their students.

## 2018 STAFF AWARDS

Amber Lee, Financial Clerk, received a Department Excellence in Service Award in appreciation for her dedication in providing financial support services to the Department faculty and students.

Richard Ryoo, Storekeeper, provides ordering and receiving services as well as waste handling services to the Department faculty and students. Richard is one of the busiest storekeepers on the UBC Vancouver campus and received a Department Excellence in Service Award for his work.



Anniversaries and Excellence in Service were celebrated by (L-R) Lori Tanaka, Richard Ryoo and Amber Lee.

# STUDENTS: THE CORE OF WHAT WE DO

Marlene Chow

Chemical Engineering was established under the Department of Chemistry in the Faculty of Arts at UBC in 1915 as the first Canadian chemical engineering program west of Ontario. In 1954, Chemical Engineering became a distinct department. Over the years the Department has evolved and is now known as the Chemical and Biological Engineering Department. Along with excellence in research, the Department has developed a reputation for excellence in teaching in both undergraduate and graduate programs.

Our undergraduate program has grown to 467 registered undergraduate and 142 graduate students in the 2018 year. Our student body is diverse and includes 280 international students from 42 countries and is almost 40% women.

The Department offers two undergraduate programs, Chemical Engineering (CHML) and Chemical & Biological Engineering (CHBE). Approximately 65% of undergraduate students are in the (CHML) program and 35% in the (CHBE) program. Both undergraduate programs are accredited by the Canadian Engineering Accreditation Board (CEAB) and our students graduate with the academic requirements needed to become licenced Professional Engineers in Canada.

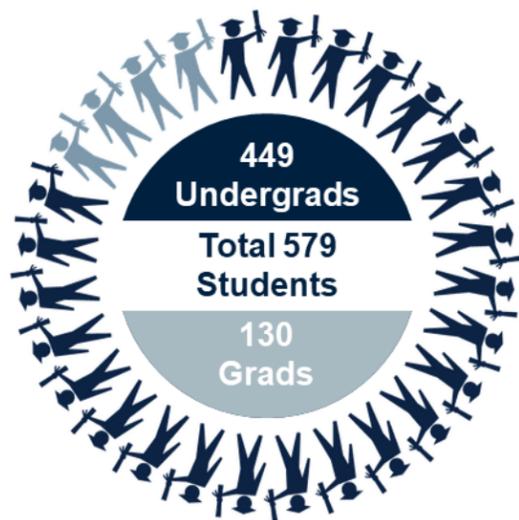


FIGURE 1.

609 total students  
 • 467 undergraduate students  
 • 142 graduate students

280 international students from 42 countries

132 degrees granted in 2018

During 2017, our programs underwent an accreditation review and in 2018, the Department received the news that we obtained the maximum six year accreditation term.

Our Department curriculum provides opportunities for hands-on learning through lab courses included in every term of the curriculum. Many courses include guest lectures from industry experts and the Third Year Field Trips incorporate industry tours into the term. The industry tours complement academic curriculum content and provide students contact with industry professionals and networking opportunities.

Updating the curriculum to remain a leader in Chemical Engineering education is an ongoing effort. Currently, the Curriculum Committee, led by Dr. Louise Creagh, is implementing

updates to the curriculum starting with the second year courses. The new and revised courses will give the opportunity to better integrate theory, experiment/applications, and technical communications across the second year.

In addition to curriculum updates, faculty contribute to learning enhancements within current courses. These enhancements include integration of tools such as Python, coordinating projects and learning between courses and increasing student design opportunities in courses. Students can and are encouraged to contribute to curriculum changes. A student team and their interest in the Internet of Beer led to a problem based fourth year lab experiment in beer production. Andrew Sheroubi, a fourth year student, led a 3-credit student-directed seminar course, Humanitarian Engineering, under



## CHBE AT A GLANCE 2018/19

### OUR STUDENTS

Undergraduates	
CHML	327
CHBE	140
Total	467

- 467 total undergraduates (up 3.8% from 2017/18)
- 327 CHML (up 6.1% from 2017/18)
- 140 CHBE (down 1.4% from 2017/18)



181 undergrads in CHBE are international, a 3.3% increase over 2017/18 (UBC 26.3% 2017/18)

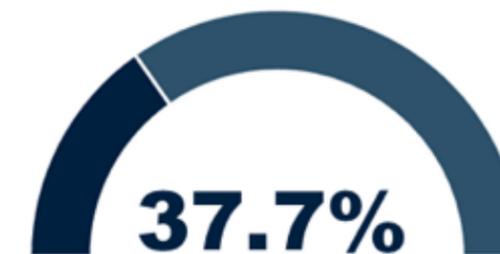
FIGURE 2.

the direction of Dr. Gabriel Potvin. The goals of this course were to encourage engineers to be more globally minded and aware of the context and underlying factors behind humanitarian and social issues. For the course final design project, multidisciplinary student teams chose a problem statement provided by non-profits and charities from around the world. All of the organizations are using the final project reports in some capacity.

Students are encouraged to consider Co-op and Coordinated International Exchange (CIE) programs to enhance their academics at UBC. Students accepted into the co-op program complete a minimum of four work terms, experience that is valuable for developing their careers. Students completing co-op programs receive credit for one year of work experience towards the four years required for their Professional Engineer status. CIE

students can attend partner institutions in Europe, Australia and Asia, taking courses that transfer credits to their UBC degree. International experience broadens students' perspectives in an increasingly global economy and provides personal enrichment.

Despite a demanding academic load, our students are engaged in many extracurricular activities, including those planned by the CHBE Undergraduate Club, Engineering Undergraduate Society, student teams, engineering competitions, research competitions and even directing courses. Extracurricular activities provide students with opportunities to apply their engineering skills, to work in multidisciplinary teams and to develop entrepreneurship and other skills. The engagement of students in student teams has increased significantly over the past five years. Chem-E-Car, a competition team,



176 undergrads in CHBE are women, a 0.6% increase over 2017/18 (UBC Engineering 25.9% 2017/18)

### COOP EXPERIENCE

CHBE collaborates with community, industry, government, and university partners to provide enriched educational experiences for students.



54% undergraduate students participate in these experiences by the time they graduate.

builds a shoebox-sized vehicle powered by student produced batteries and is stopped using a chemical reaction. The team expanded and resulted in the formation of Envision, an umbrella administrative group which assists and promotes other student teams. Envision teams include Chem-E-Car, BioT, AgroBot and Green Joule. Innovation OnBoard, founded by CHBE students Athanasios Kritharis and Vasilii Triandafilidi, assists undergraduate and graduate students to develop an entrepreneurial mindset and gain the necessary mentorship to create successful ventures through innovative engineering.

Our Newsletter provides readers with a snapshot of our students and their achievements. ■

# CHBE CURRICULUM IMPROVEMENTS

Dr. Jonathan Verrett

With the ever-changing demands of industry and academia, the university curriculum requires continual improvement to introduce new methods of teaching and learning in areas such as programming, design and instrumentation. The Open ChemE initiative was initiated to address these needs.

The Open ChemE initiative was started in early 2017 by Dr. Jonathan Verrett and funded by a Teaching and Learning Enhancement Fund grant from the university to integrate and build open educational resources into the second year Material and Energy Balances course (CHBE 241). Open educational resources are resources that once created, are freely available for distribution and re-use. Certain conditions may apply to these resources such as the need to attribute them, or their use for non-commercial purposes. In the year following its inception, the initiative built a set of online homework problems, created an online course guide, and organized openly available online content to supplement the existing course materials in CHBE 241.

The philosophy behind the initiative was to use or adapt existing resources where available. For online homework, this meant using a robust system that is already heavily used in the math department at UBC and a broad range of other institutions called WeBWork. WeBWork supports a variety of inputs such as numbers or equations and can randomize problem parameters to give each student a unique question. These problems can be shared through the Open Problem Library (OPL), which is a growing repository of over 35,000 problems thus far. However, very few engineering problems are available in the OPL, and none existed for material and energy balances. CHBE doctoral candidate Jun Sian Lee led the development and deployment of 60 problems in the course

during the 2017/2018 academic year. Student feedback from this change was very positive and students appreciated having a tool that could give them instant feedback on homework problems. Time dedicated to assignment marking was also reduced in order to put more teaching resources towards interactions with students in lectures, tutorials or outside of class. Now that these problems have been tested in a course iteration they will be uploaded to the OPL to be shared with other faculty and will continue to be used and built upon in the coming course iterations.

Independently, similar work was also being done by Dr. Agnes D'Entremont in the Department of Mechanical Engineering (MECH) and Dr. Negar Harandi in the Department of Electrical and Computer Engineering (ECE). With the overlap in fundamental topics at the second year level in many engineering programs such as fluid mechanics, solid mechanics, circuits, signals and systems and electromagnetics, a new Teaching and Learning Enhancement Fund project was proposed and awarded funding in 2018 to expand WeBWork to include a selection of second-year engineering topics. The project also garnered funding from BC Campus, a provincial government organization funding educational innovation in BC. Due to the common course requirements of each program in the second year of engineering studies, the project impacts all 930 second-year engineering students at UBC from every engineering discipline. This project has thus far created

over 800 problems and deployed these in 13 UBC courses in the 2018/2019 academic year including creating 150 questions for the CHBE fluid mechanics course.

*When looking into online course materials for CHBE 241, undergraduate students Said Zaid-Alkailani, Ngai To Lo, Victor Chiew and Siang Lim analyzed the landscape in terms of what was already available openly.*

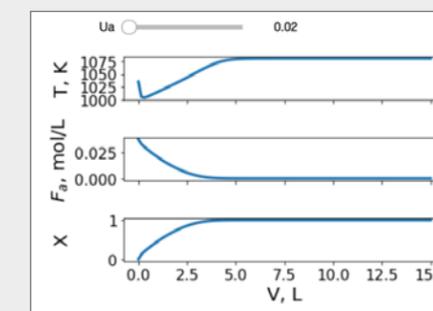
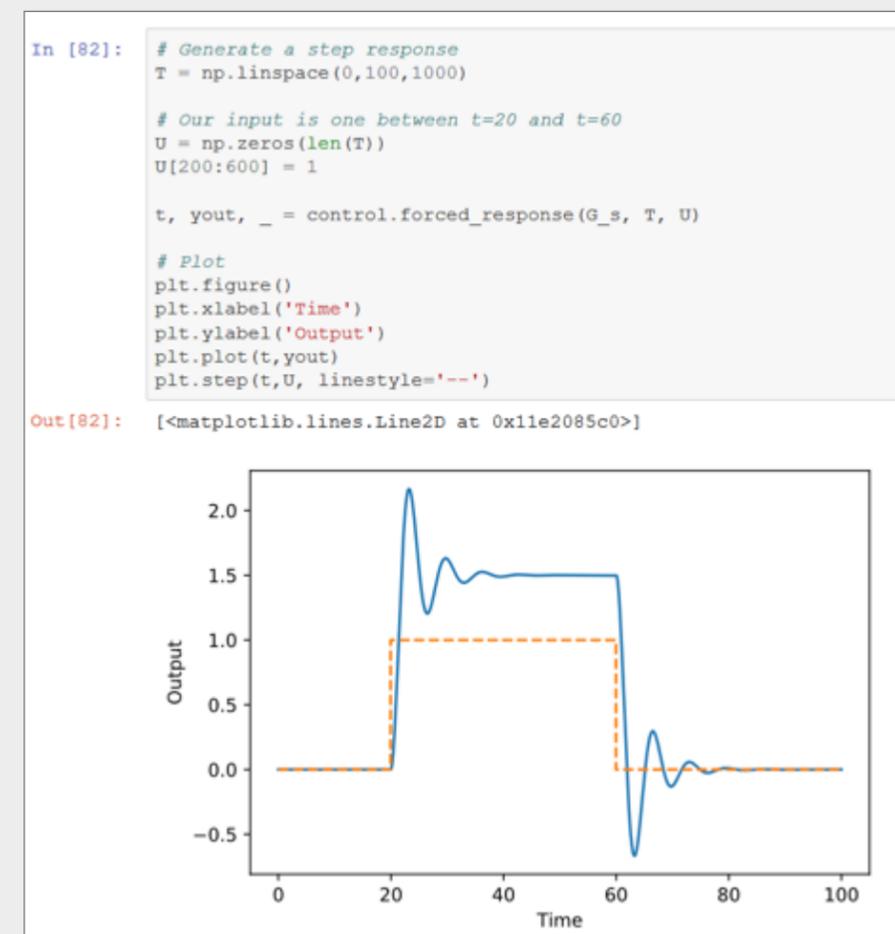
Despite finding a number of video repositories, there was little in terms of written content that could be adapted to the CHBE 241 course at UBC. Subsequently the four students spearheaded the creation of an online course guide using UBC's Wiki, which runs on the same software as Wikipedia. Class students are very familiar with this format and course exercises focused on the use of Microsoft Excel, which students also use in their second-year lab courses.

The development of educational resources was carried out by a group comprising undergraduate students, Siang Lim and Athanasios (Thanos) Kritharis, and doctoral candidates Vasilii Triandafilidi and Yiting Tsai, as well as course instructors Dr. Vikram Yadav and Dr. Bhushan Gopaluni. Specifically, they wanted to introduce Python programming and design skills for students in Kinetics and Reactor Design (CHBE 355), Advanced Reactor Design (CHBE 550) and Process Dynamics and Control (CHBE 356). They have created updated resources for these courses, by integrating Python-based tutorials, homework and project assignments into the courses. Inspired by the success of OPL and WebWork the team saw the potential of creating an online course guide using a relatively new platform called Jupyter Notebooks. These notebooks are based

on the Python programming language, and allow students to run Python code within the notebook. They also include text blocks that can be used to explain course content, coding or other features. These notebooks can be downloaded to a student's computer or used through their web browser. UBC has a server setup dedicated to hosting these notebooks. The team has already deployed a test program for CHBE 550 and CHBE 355 in 2018 which was met with positive feedback from students, who have especially praised the benefits of Python knowledge in their co-op experience. The team is now in the process of deploying the second iteration of these new course resources in term 2 of the 2018-2019 academic year and has expanded to include UBC Engineering Physics students, Eugene Shen and Nikolaos (Niko) Ioannidis. Two more

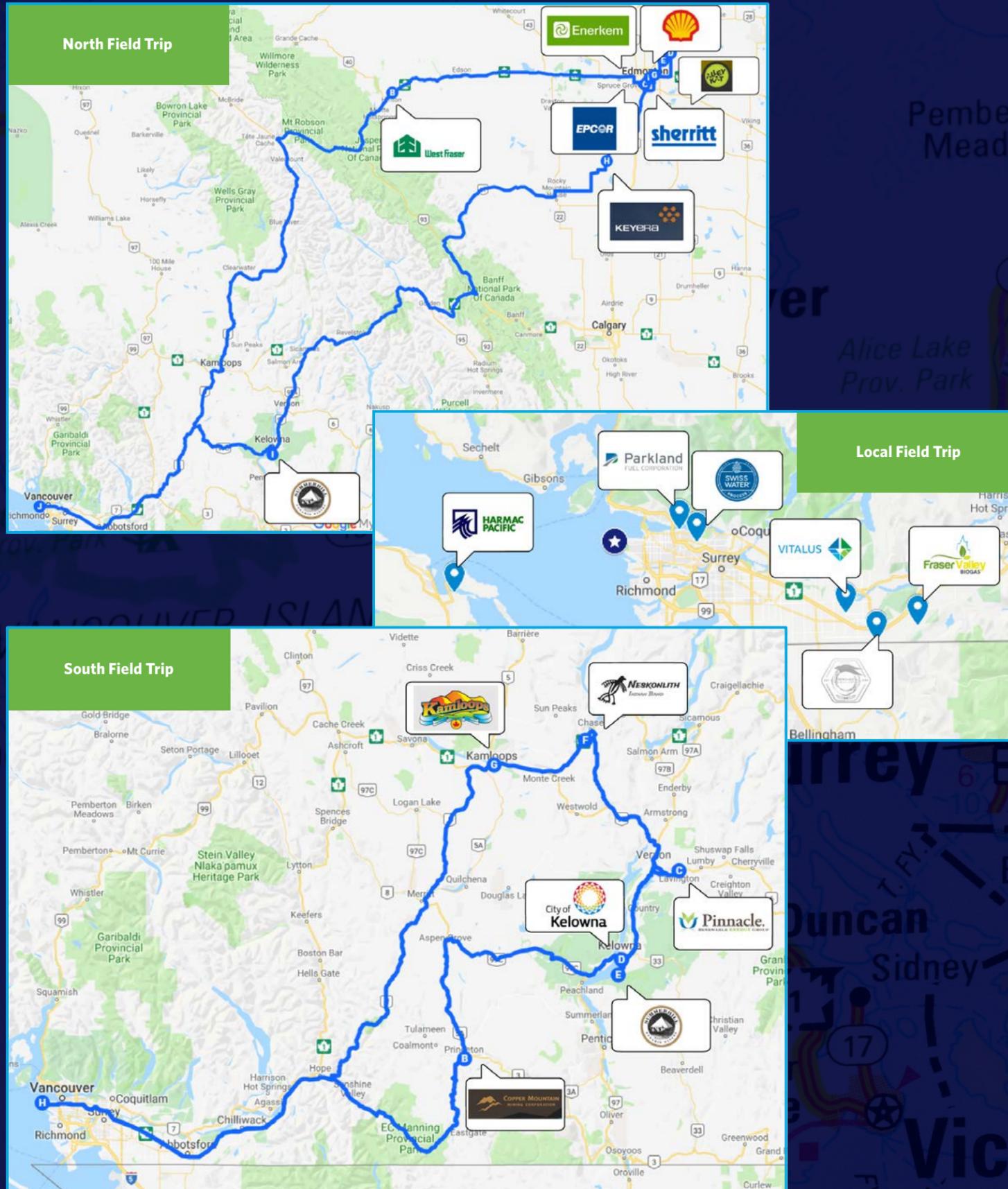
iterations are planned in the following years to continue improving these resources. All work produced by the team, including Python codes and Jupyter Notebooks, is available online in our GitHub repository at "[OpenChemE.github.io](https://github.com/OpenChemE)" under a Creative Commons license.

Over the span of 3 years the Open ChemE initiative has been successful at creating new and useful resources for students and faculty. To date it has enhanced the curriculum of more than 500 students and has created innovative ways for students to learn. The stakeholders engaged in these projects have continued to innovate and find new partners both within the department and across the faculty to continue to push the boundaries and bring the best in terms of teaching and learning resources to the department. ■



↑ A screenshot from a Jupyter notebook from CHBE 355 **Kinetics and Reactor Design** course showcasing modeling of a Plug Flow Reactor with heat exchange. By varying the heat transfer coefficient  $U_a$ , students are simulating the reactor between adiabatic and diabatic regimes.

← A screenshot from a Jupyter notebook from CHBE 356 **Process Dynamics and Control** course showcasing coding input that can be manipulated and the corresponding graphical output.



## CHBE THIRD YEAR INDUSTRIAL TOURS

The CHBE Third Year Field Trip is a tradition that is more than 40 years old and is considered by students to be one of the highlights of their academics. The Field Trip is integrated into the curriculum through the third year lab, CHBE 362, Process and Environmental Engineering Laboratory. Students are provided with the opportunity to tour industrial operations, which complements their academics. On tours, students view the unit operations and processes that they have learned about in the classroom. Also, students are exposed to safety and environmental management of processes and operations. On the industrial tours, students meet industry professionals in their work environment, developing an understanding of engineering roles and learning about career opportunities.

For some students, the bus field trips can be their first travel outside of Vancouver, an opportunity to see the beauty of western Canada. With the time travelling together, students form friendships and develop comraderie, beneficial as many CHBE course projects are group work. The Class of '93 field trip memories are evidence of the impact of the field trips!

For the 2018 Fall Field Trips, 20 host companies provided 21 tours to the class of 136 students, the largest 3rd year class ever registered in CHBE. The field trip was coordinated with CHBE staff and with assistance from the Third Year Class Representatives, Sarah Stumpf and Connor Meinke. Students selected one of three options; a North road trip to Hinton and Edmonton, a South Columbia road trip or a Lower Mainland and Island Local field trip.



Students at Copper Mountain.

All three field trip options included a Kraft pulp mill tour, the Domtar Pulp in Kamloops, the Hinton West Fraser in Hinton, Alberta or the Harmac Pacific pulp mill in Nanaimo. Several of the engineers at the pulp mills coordinating and leading tours were Chemical Engineering alumni, many of who remembered their field trips! Students found that pulp mills are complex and highly technical operations, processing wood chips into pulp, using innovative technology. They were interested to see how pulp mills maintain an ecological balance by taking care of the forest regions for sustainability and were amazed to see how a mill is designed to recycle all chemical reactions and byproducts and to maximize efficiency.

*“On the pulp mill tour, I was awestruck by scale of operations and complex nature of converting wood chips to pulp and paper.”*

In addition to pulp mills, resource operations tours included Copper Mountain and Sherritt Metals. Mining and metal processing operations have extensive chemical engineering operations. Copper Mountain produces 90 million pounds of copper equivalent per year and students were impressed by massive size of the Copper Mountain equipment and operations. It was beneficial for tour participants to see a brief overview of the mining process, the ball/sag mills in action and the consideration for reclamation.

Sherritt is an industry leader in the mining, processing and refining of lateritic nickel and cobalt. The Sherritt Fort Saskatchewan tour included their nickel and cobalt refining operations as well as their research and development facilities. Interesting to students was that the feedstock refined in Fort Saskatchewan is shipped from Moa, Cuba. Students observed that Sherritt has an impressive integration of external natural gas supply, in-plant steam reforming facility, in-plant Haber process facility and the major Ni/Co refining plant.

Energy operations tours included traditional oil and gas operations, Shell Scotford Refinery, Keyera Rimby Gas Plant and Parkland Refining, as well as new energy technology operations, Enerkem Alberta Biofuels, Fraser Valley Biofuel and the Pinnacle Renewable Energy Lavington Pellet Plant. Many of the facilities included distillation and other separation operations, as well as chemical and biochemical reactors, all unit operations and processes in chemical engineering. Common to all the operations was a focus on improving efficiencies and sustainability.

The Shell Refinery and Upgrader was the highlight of the north trip for some students. Through the Shell tour they developed an understanding of the different refined products that come from the crude oil. Shell's innovative technologies implemented in moving towards a cleaner future, including the Quest carbon capture and storage, sparked significant student interest.

The Keyera Rimby Gas Plant is a midstream operation and the tour provided students with a detailed fundamental inside view which was particularly beneficial for those who have not had experience in the natural gas industry. Keyera's plant equipment and process changes demonstrated clearly that operations need to be flexible due to feedstock or product changes.

At Parkland, students observed that distillation is a large part of chemical engineering, and that the refining process equipment requires constant maintenance and repair due to the size of the facility. Chemical processes must be maintained and carefully tuned to ensure safe operation.

The Enerkem Alberta Biofuel plant was very impressive, transforming Edmonton municipal garbage into ethane/methane using gasification. Enerkem provided insight on the rapidly changing energy and waste industry and the many innovative technologies that can completely change the way we approach our energy needs

Fraser Valley Biofuel (FVBG) is very eco-friendly. While turning biological waste into usable energy, FVBG is developing additional strategies to minimize the waste material from its operations.

Pinnacle produces pellets using sawdust and small pieces of wood that would otherwise have been waste. The pellets are a fuel alternative to coal and are shipped to European customers.

In addition to industrial operations, students toured municipal facilities including the drinking water operations at the Kamloops Water Filtration Plant and the Neskonlith First Nation community, a small remote community. Students were surprised that only two individuals ran the entire Neskonlith operation. The process differed significantly to the Kamloops water treatment plant in technology and in scale.

Wastewater facility tours included the, Epcor Gold Bar Wastewater in Edmonton and the Kelowna Wastewater Treatment plants. Having a general idea of the physical processes in wastewater treatment, students were interested to learn about the biological processes involved in wastewater treatment. The microbes involved are constantly recycled.

Food and beverage tours included Summerhill Pyramid Winery, Alley Kat Brewery, Crowsnest Distillery, Vitalus Nutrition and Swisswater Decaffeinated Coffee. At Vitalus Nutrition, students viewed the unique processes for taking dairy and turning it into “dairy ingredients” and specialty products. Students also noted that cleanliness standards and regulations set for chemical engineering involving food processing can be strict.

The decaffeination process is very complicated and students found the Swisswater process fascinating. In addition to viewing the decaffeination process, students learned about coffee tasting. The complexity of producing wine, a biological process, was also observed by those visiting Summerhill Pyramid Winery. “It was amazing to know how much process is involved to make a bottle of wine.” The manual grape picking operations were a large contrast to automated processes seen in other plant tours. Students were appreciative of the wine tasting following the tour! Students were also treated to product samples at Alley Kat Brewery and Crowsnest Distillery.

Throughout the various industry tours, students were able to observe that unit operations such as distillation are common. Students also noted that that all operations placed high emphasis on safety, from proper Personal Protective Equipment, safe equipment design and processes to safe practices and procedures. Environmental considerations were also a large focus of operations. Most industrial operations had high levels of process control and were focused on improving the efficiencies of their operations to reduce waste and energy by recycling and reuse practices. ■

## SUMMARY

The 2018 third Year Field Trips were a tremendous success! During industry tours, students learned about processes, the integration of recycling, environmental considerations, control systems and safety in operations. Students were also exposed to the importance of the need to develop teamwork, communication and other skills. Students returned from the field trips, energized, with an appreciation of how their academics can lead to many different career opportunities. The students enjoyed camaraderie with their classmates, developed on long bus and ferry rides. In their travels, some students were lucky to experience British Columbia and Alberta's beautiful landscapes and a bit of wildlife including viewing an elk and the beginning of the Adam's River salmon run.



Plant manager Brian Mills leading a plant tour of the Enerkem Alberta Biofuels explains how the City of Edmonton municipal waste is converted to methanol and ethanol through thermochemical processes.



Kenzie Harmsworth, EIT, leads a tour of the Edmonton Epcor Gold Bar Wastewater Treatment Plant. Gold Bar uses pretreatment, primary and secondary treatment, final clarification and UV treatment before releasing treated wastewater to the North Saskatchewan River.



CHBE students learned about the complexity of pulp mills including the integration of chemical recovery and reuse. Students in the dryer area of the West Fraser Hinton Pulp Mill.



CHBE students with Keyera hosts at the entrance of the Rimbey Gas Processing Plant, a midstream processing operation. Keyera hosted students with process overviews, a detailed tour and lunch.



A group of enthusiastic students at the Pinnacle Renewable Energy Lavington plant.

Photo Credit: Tara Green

### ACKNOWLEDGEMENTS

We thank the participating industry partners who opened their doors, welcomed students and provided staff and resources so that students could see their facilities, gain understanding of their operations and meet operators and engineers. We gratefully acknowledge the financial support of the Class of '93 for their generous donation in support of the 2018 CHBE field trips. We also thank the Shell Canada Ambassador Program (CAP) for its ongoing generous financial support of the field trips. CAP takes the classroom outside campus borders, giving students first-hand experiences and a greater understanding of engineering in the field.



A sunny ferry ride from Vancouver to Nanaimo was enjoyed by students travelling to the Harmac Pacific Pulp Mill.



Summerhill Pyramid Winery

Photo Credit: Abhishek Lekhi

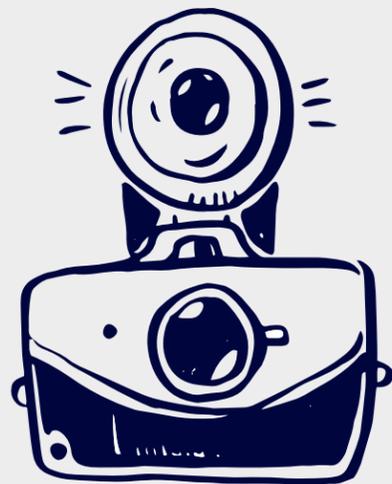


Students with Shell Scotford hosts in front of the refinery. Students toured the Scotford Refinery and also learned about the Quest Carbon Capture and Storage Project which reduces CO2 emissions from Shell oil sands by capturing CO2 and storing it underground.

# CLASS OF '93

## CHEMICAL ENGINEERING FIELDTRIP FLASHBACK

Roberta Cameron, Class of '93



It was spring 1991, our annual break from UBC chemical engineering. Many of us dove into 18 weeks of relevant work experience to earn money for another glorious year at UBC. We were lucky, even if we didn't know it at the time.

Phil Weiss stayed on UBC campus for the summer on business. I went to the oil fields near Grande Prairie. We vowed to stay in touch all summer to organize, plan, schedule, budget, and fundraise for our 3rd year class industrial field trip. With no world wide web, imagine us using letters and postage stamps back then.

We split the work. We approached companies to either provide technical tours, financial sponsorship, or both. Early in the spring, many letters were sent with hope. By mid-summer, we had a plan. We booked our 43-student charter bus in anticipation of a jam-packed adventure in mid-September. We planned visits to the chemical plants and energy sector of Alberta and through the Okanagan wine country. Classmates agreed to stay 4-to-a-room in selected hotels and we planned various restaurant and entertainment stops. Dr. Bruce Bowen volunteered to join us from the faculty. The itinerary was set.



At the outset, we drove from Vancouver via Kamloops to Edmonton for a few nights at our choice budget hotel. Here we are at a TGIFridays downtown.



We got a top-notch tour of the expansive Dow Chemical facility at Fort Saskatchewan, where they synthesize ethylene. In east Edmonton we visited Celanese Canada, a previous manufacturer of both methanol and a petrochemical-based filament used for making cigarette filter tips. On our way west from Edmonton, we had a memorable stop at TransAlta at Wabamun, previously a coal-fired plant which mined sub bituminous as a fuel source. Here we all are inside their mammoth mining bucket.



While in the Edmonton area, we also toured the Petro Canada refinery, which is now part of Suncor Energy.

Our class got a real treat after all this, as we passed through both Jasper and Banff national parks at a stunning time of year. We treasure many moments from that journey. When we arrived in the Okanagan, we stayed for a night in Kelowna. The highlight there was a generous tour of a regional winery, complete with sampling and judging of the manufactured products. We arrived home as a close-knit class, exhausted but inspired and ready to hit the books. ■

# COORDINATED INTERNATIONAL EXPERIENCE (CIE): HYGGE

Jordan Wright

Hygge is a Danish word that doesn't translate well into English, but embodies coziness, warmth, togetherness, and, coincidentally, my experiences at DTU. DTU is located a short 40 min transport ride from downtown Copenhagen in the lovely Lyngby commune. My first observation of DTU campus was a strange coziness, its stately buildings and industrial features softened by green space and sporting fields. This observation foreshadowed the amazing connections I made during Intro Week, which gave rise to even more deep connections. Now, I find myself part of a close-knit family of peers in Denmark who, long after the end of my term, are the core of my international network. While it may be simple luck that this happened so quickly for me, I believe what made DTU a great home for my exchange is expert campus and classroom design.

Each building is designed with ample common space suitable for group work of all sorts and the class-sizes are small and comfortable. Campus is full of events and the student pub is a great place for a cheap beer with your new friends. Group project or report work in courses is very common and, in many cases, will replace assignments one would be doing individually for credit at UBC. I found this worked well for simulating the sense of responsibility attached to a real workplace environment and was worth the extra self-discipline required to keep up with the unmarked exercises. If you find you have spare time outside of school and travel, you can even indulge your entrepreneurial side at DTU Skylab, which is accessible to every student for rapid prototyping and other product development activities. DTU truly is a playground for hands-on innovators; however, the freedom to travel Europe with ease is what I found myself captivated by this time around.



Jordan Wright — FCK at Parken Stadium.

Denmark is a great choice for those wishing to experience a culture that puts its future first. Heavily invested in social programs, Danes trust each other to find passions that will provide value to their society. Health care is free for everybody (even tourists). Local students are paid a living allowance to attend university and everyone enjoys an insanely high minimum wage. Combining this with their ambitious energy targets makes Denmark a paradise for the progressive, environmentally conscious engineering student. If you also happen to be interested in biological engineering, I highly recommend the Production of Biofuels course for the chance to gain lab and plant design experience, as well as the opportunity to see a Danish Biogas production plant in person. It's a Masters course at DTU, but I found myself very comfortable as a third year Chemical engineering student. I'm very excited to share my newfound knowledge with everyone back at UBC, so if you have any questions about my exchange, don't hesitate to get in touch! ■



## IF YOU CATCH THE TRAVEL BUG AND CHOOSE DTU FOR YOUR EXCHANGE, I RECOMMEND THAT YOU:

- 1. Stop by London on your way to Copenhagen.** The city is an absolute must-see if you have an interest in history and the biggest museums there are completely free. The British Museum is full of extraordinary artifacts (like The Rosetta Stone) and the Science Museum will help you appreciate how far we've come as engineers. If you can afford it, give the city at least a week. It's worth it.
- 2. Stop by anywhere you can.** In the second semester, there is an Easter break in April, but I also recommend taking some time after exams. Flights to anywhere in the EU are pretty cheap so just consult with your new best friends, Skyscanner and Hostelworld, well in advance to see which route through Europe works for you. Pack light as discount airlines do not mess around with overweight baggage and most good hostels offer a laundry service. €7 per load is a lot better than €10 per kilo. Plan your meals in advance to avoid tourist traps and save money.
- 3. Don't forget to see Denmark!** Copenhagen, Aarhus and Odense are incredibly beautiful and historic cities in their own right. Chat with the locals (in English), try the free Danish lessons (yes, they have those), ride a bike and enjoy the amazing culture and high standard of living. Just don't expect it to be cheap (ask about student discounts).
- 4. Seriously, get a bike.** If buying one instantly is too much pressure, you can rent one second-hand through a DTU start-up called UniBikes.

# CO-OP

Overview of the Virtual Surgical Planning Process.

Edward Wang



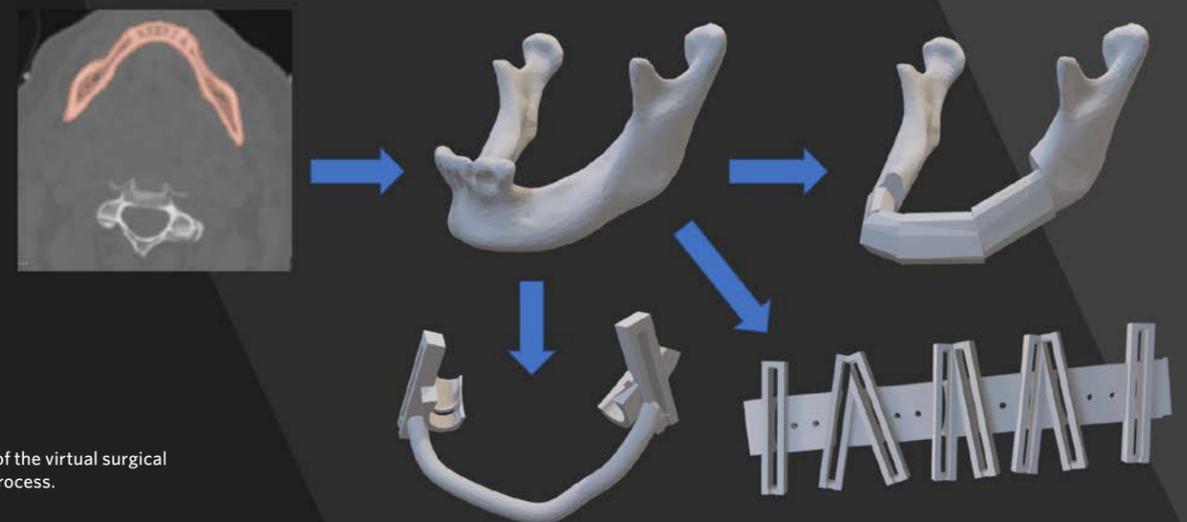
Advanced head and neck cancers that involve the mandible or maxilla often require surgical removal of large segments of bone, including significant portions of the jaw or cheek. Reconstructing the resulting defects from these aggressive resections is essential to restore not only facial form but also its function, such as chewing, swallowing, speech and breathing. Reconstruction is afforded by transplanting donor bone, muscle and skin from the patient's own body to the resected region. Traditionally, the fibula or scapula are used as donor bone, and require multiple freehand bony cuts in complex orientations to recreate the original 3-dimensional shape. Accuracy of the reconstruction has significant restorative implications and benefits to the patient's quality of life. The current improvisational approach continues to be challenging and time consuming and may not result in an optimal reconstruction. To improve this process, patient imaging data can be used to create a reconstruction plan

that is actualized through surgical cutting guides. We have developed an in-house semi-automated virtual platform that plans mandibular reconstructions from patient CT data, and generates cutting guide models that can be 3D printed. Our workflow is low cost and self-contained, which make it a viable improvement to current interventions. Over the last two years, we have been evaluating our platform clinically through a case series of twenty patients.

My primary responsibility during my first 12-month work term was to design and build the planning software, which creates the reconstruction plan and models of the cutting guides. The cutting guides need to be sterilized, and I worked with a local biomedical company to set up a pipeline. I met with hospital engineers and staff to obtain the necessary approval for the guides to be used intraoperatively. This step was critical to proceed with the clinical trial.

In addition to my technical duties, I also performed administrative tasks, most of which included writing research grants. We were awarded a Canadian Medical Association Joule Innovation Grant and a Michael Smith Foundation Health Professional Investigator Award. Finally, I was involved in the hiring process of co-op students by interviewing and creating a shortlist of candidates for my supervisor, and training and onboarding them before I returned to school.

I returned to hospital for a 4-month work term after my third year, and my duties were less technical and higher level, with a focus on research. While I was at school in between work terms, I remained involved with the project, and provided mentorship and support to the co-op students. ■



Overview of the virtual surgical planning process.

# Innovation OnBoard

Athanasios Kritharis

Innovation OnBoard was founded in 2017 by CHBE students Athanasios Kritharis, fourth year undergraduate, and Vasily Triandafilidi, PhD candidate, after their experiences in the UBC entrepreneurial ecosystem. They experienced the failure of their own startup after spending more than a year entering competitions, prototyping and intense networking due to poor planning in product market fit. As typical engineers, they found a solution first, THEN tried to create a problem.

Consulting with Blair Simonite, Director of e@UBC, Vasily and Athanasios devised a program to help undergraduate and graduate students develop an entrepreneurial mindset and gain the necessary mentorship to create successful ventures through innovative engineering. With co-founder Said Zaid joining the team, Innovation OnBoard fostered 15 innovative teams in its first year of operation.

Innovation OnBoard is a 6-month program consisting of workshops, competitions, and interviews with industry experts designed to foster a culture of entrepreneurship at UBC. The focus is on developing businesses around health, environment & energy, and food. Prospective innovators are free to bring their own ideas or they can be paired with industry partners who have problems that need innovative solutions. After a

personal interview with the organizing team, all competing teams are partnered with industry expert mentors who specialize in the field of their start up. The program culminates in a two stage competition with a poster session followed by a Dragons' Den styled pitching session with the top 3 teams sharing \$10,000 in prizes and they are provided spots in the e@UBC Lean Launch Pad Program. ■

## THE TOP TEAMS IN THE FIRST PITCH COMPETITION IN FEBRUARY 2018 WERE:

1

### CLEO

One in three women experiences urinary incontinence at some point in their lives. This often happens after trauma, such as childbirth. Current best practice guidelines show that pelvic floor exercises (Kegels) are effective in fixing this. Cleo is an invention using near-infrared spectroscopic technology for non-invasive transvaginal monitoring of urological tissues. The Cleo device and the app will be offered directly to women and will be used for pelvic floor exercises at home.

2

### BIOMOD

222,500 people a year are diagnosed with lung cancer in America. Most lung cancer is diagnosed when in its later stages and the survival rates of people with lung cancer is extremely low. BioMod is developing an assay for the early detection of lung cancer from blood samples. The assay uses inexpensive components and does not require any additional expensive equipment compared to what can be found in most diagnostic labs.

3

### AWESEM

One of the most fascinating and useful areas of technology is high-resolution imaging, which is typically done with an electron microscope. However, electron microscopy is restricted to those who can afford the high cost. AweSem is an innovative project to bring electron microscopy to the masses by designing, building, and commercializing an inexpensive and portable scanning electron microscope.

# OIL AND GAS INITIATIVE

Colton Smithson

The UBC Oil and Gas Initiative hosted several speaking events throughout the year to connect students with petroleum professionals. For the 2018 Speaker Series, a total of five speaking events were organized covering many aspects of the oil and gas industry.

The Oil & Gas Initiative

The first speaker event was Dr. Ian Frigaard, a UBC Professor of Mechanical Engineering and Applied Mathematics. His presentation, "Why do Wells Leak and Who Cares?", covered the causes, concerns, and challenges associated with methane leaks from gas wells across the country.



Oil and Gas Initiative — Dr. Friggard Lecture.



Oil and Gas Initiative — Society of Petroleum Engineers Event.

The second speaker event was Mr. Michael Schoen, a Senior Instructor with the CHBE and Mining departments. His presentation, "Producing Bitumen in Oil Sands", covered the history and development of the Canadian oil sands. As well, the presentation highlighted the environmental challenges associated with oil sands production and provided some of the engineering solutions that have reduced environmental impacts.

In collaboration with the Society of Petroleum Engineers (SPE) Vancouver Chapter, three speakers were organized for the third event. This was the first major collaborative event for the UBC Oil and Gas Initiative and SPE Vancouver Chapter:

- Tessa Gill, former VP of External Affairs for Pacific Northwest LNG, spoke about the Canadian Liquefied Natural Gas (LNG) industry and the future steps needed to successfully develop the industry in Canada.
- Steve Rogers, a principal geoscientist and specialist in fractured reservoir characterization, discussed fracking and debunked many of the myths associated with the fracking process.
- Marcel Guevara, a specialist in management systems and environmental health and safety protocols, spoke about the environmental legislation and permitting associated with oil & gas projects at the BC provincial level and Canadian federal level.

The fourth speaker event was Dr. John M. Shaw from the University of Alberta, a UBC CHBE alumni. His presentation, "Thermodynamic and Energy Model Selection for Process and Product Design", highlighted possible thermodynamic models that can be used in systems designs and explained how a decision tree approach can simplify the model classification process for diverse process scenarios.

Finally, in the Fall of 2018, for the fifth speaker event, Peter Rutherford, a Professional Engineer with both international and domestic experience in the oil and gas industry, presented, "The Role of a Chemical Engineer". Drawing examples from his own experiences, Peter showed students design and project situations that they could expect to encounter once they enter industry after graduation.

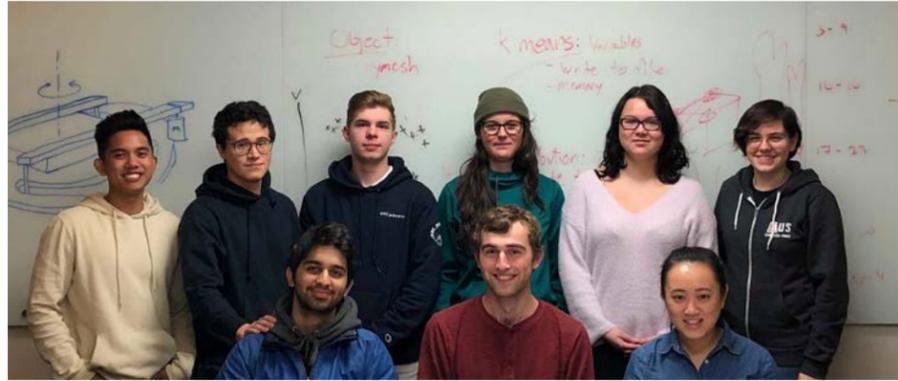


Oil and Gas Initiative — Rutherford Event.

# UNDERGRADUATE CLUB

**Robin Lai**

The Chemical and Biological Engineering Undergraduate Club organizes and runs academic, social, sports and industry events throughout the academic year to enrich the student experience in CHBE. The Club also represents CHBE in the Engineering Undergraduate Society and acts as an interface between the students and the department.



CHBE Undergraduate Council. **Front, left to right:** Nabil Ali-Mohamad, Conrad Inch, Robin Lai. **Back, left to right:** Shawn Esquivel, Eduardo Mejia, Eric Grant, Tatjana Stone, Jessica Yamamoto, Dana Mraz.

## E-WEEK

Each year, the Engineering Undergraduate Society holds E-Week, a week-long spirit competition between Engineering departments. E-Week is a UBC tradition and featured events include Chariot Racing along Main Mall, Cooking with Beer, and FilmFeust. The CHBE Undergraduate Club organizes teams of CHBE students to participate in and attend these events. We are pleased to announce that CHBE won the Spirit Award and finished in 6th place, significantly improving in participation and performance compared to recent years.



CHBE Undergrad Club Wins EUS E-Week Spirit Award.

## BACK TO THE 90'S



Photo Credit: Steve Reekie

# IRON RING

The Iron Ring may be worn on the little finger of the working hand by any engineer who has been obligated at an authorized ceremony of the Ritual of the Calling of the Engineer. The ring symbolizes the pride which engineers have for their profession, while simultaneously reminding them of their humility. The Iron Ring is a uniquely Canadian tradition; all undergraduates of Canadian engineering schools receive an Iron Ring to wear on the pinky finger of the writing hand to remind the wearer of the ethical and societal responsibilities of the engineering profession. The ring serves as a reminder to the engineer and others of the engineer's obligation to live by a high standard of professional conduct. The Iron Ring ceremony was held in March 2018 at the Queen Elizabeth Theatre in downtown Vancouver.



Iron Ring Ceremony.

Photo Credit: Tony Wu



Iron Ring Ceremony.

Photo Credit: Tony Wu



# PEER MENTORSHIP PROGRAM

The CHBE Undergraduate Club organized and launched the Peer Mentorship Program in September, 2018 to create connections between students of different academic years and to foster a greater sense of community within CHBE. The program pairs second year students new to the department (mentees) with upper year students (mentors) who are excited to share their experiences and provide guidance.

# ENGINEERS FOR A SUSTAINABLE WORLD

Jackson Herron



The year began with monthly general meetings discussing topics such as sustainable consumption and plastics use, sustainable urban systems, and progress on Vancouver's 2020 Greenest City Action Plan. Progress was also made on ESW's biodiesel project. With funding assistance from a Shell Experiential Learning Fund (SELF) grant, ESW members were able to replace the oil filtration system for the pilot-scale biodiesel production lab housed in the CHBE building. Replacing the filtration system was a major step forward in allowing ESW members to demonstrate production of renewable biodiesel from waste cooking oil collected from campus kitchens.

In March, members of ESW organized a successful seminar for the general

UBC population focused on sustainable agricultural technology. ESW invited Dr. Andrew Riseman from the Faculty of Land and Food Systems to speak on future agricultural technology to meet food demands for a growing population and a warming world. Dr. Riseman spoke about improvements to traditional approaches, such as crop rotations, and gave his thoughts on the buzzy topics of genetic engineering, AI, and robotics.

Three UBC ESW members, Jackson Herron, Rosemarie Nederend and Kevin Chen, were fortunate to attend the ESW General Conference in Atlanta, Georgia in April, thanks to support from the Walter Gage Memorial Fund, the Engineering Undergraduate Society Professional Activity

Fund, and the CHBE Department. The conference offered the opportunity for the students to network with peers from ESW chapters from across the United States and Canada. The students attended workshops on sustainable design and heard from speakers, such as Coca Cola's Director of Corporate Sustainability. Furthermore, a team of five women from UBC and Emily Carr University (not directly affiliated with the ESW UBC chapter) took first place in the ESW CommUnity Resiliency Design Challenge for their design of the "Neighbourhub." The Neighbourhub is a post-natural disaster meeting place and functional water storage and energy generating structure. The structure was designed with input from UBC's ESW chapter, and the chapter is continuing to work with the team (the Neighbourlab) to help them develop a prototype for their design.

Fall of 2018 brought a change in leadership for the ESW chapter and a new cohort of recruited members. ESW has continued with monthly general meetings, discussing topics including the pros and cons of a sustainability labeling system for supermarket foods, and the merits of British Columbia's new legislation on zero emissions vehicles.

In October, the chapter organized a community-building seminar by inviting Sustaingineering and UBC Solar to present their projects and network with members of ESW. This new initiative was part of ESW's mission to strengthen the network of engineers passionate about sustainability challenges, and is something ESW plans to continue in 2019. A positive outcome of this seminar was the agreement for ESW and Sustaingineering

2018 was another year of learning and growth for members of the UBC chapter of Engineers for a Sustainable World (ESW). ESW is a mission driven organization with the goals to unite networks and to empower engineers to tackle sustainability challenges.

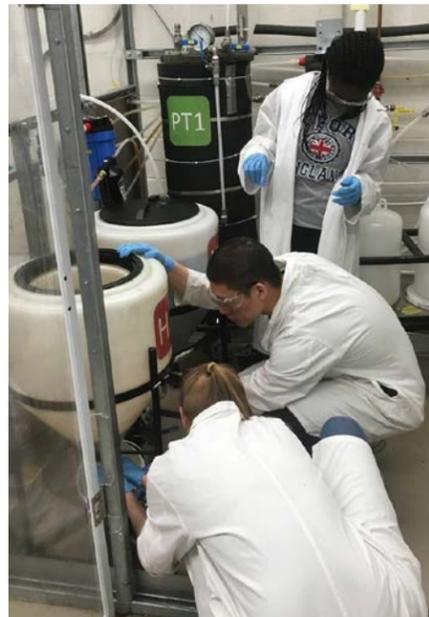
to collaborate on developing a prototype for the Neighbourhub project, and UBC Solar offering to donate unused solar panels to the project.

ESW and Sustaingineering are continuing to work with the Neighbourlab team to develop the Neighbourhub prototype. The design will feature a fully integrated electronics system with energy generation from a solar panel and bike generator, as well as energy storage and displays. The teams plan to construct and implement the prototype along the Arbutus Greenway in the first half of 2019.

Overall, 2018 brought many opportunities for ESW members to engage and connect over sustainability topics relevant to engineering, and the chapter is excited to continue its activities in 2019. UBC's ESW chapter is grateful for the continued support of the Engineering Undergraduate Society and the CHBE Department. ■



Engineers for a Sustainable World & Sustaingineering Team Up with Neighbourlab to Draft the Neighbourhub Prototype.



Engineers for a Sustainable World Students Replace the Filter for Pilot-Scale Bio-Diesel Production System.

**Engineers for a Sustainable World**  
DESIGN • EDUCATE • BUILD

**The Role of Engineers in Sustainable Food Production**

Sustainability in the Food and Agriculture Industry is a major concern today. The UBC chapter of Engineers for a Sustainable World is hosting a speaker series under the expertise of Dr. Andrew Riseman from Land and Food Systems at UBC. Dr. Riseman will be speaking on the Role of Engineers in Sustainable Food Production.

**Chemical and Biological Engineering Building, Room 202** **Friday, March 2nd 1-2pm**

Dr. Riseman's research interests include understanding the role plant genetics play in the design of sustainable production systems, identifying pertinent traits useful in these systems, combining them within superior germplasm, and integrating this germplasm into an optimized system. His general areas of interest include plant breeding, intercrop interactions, nutrient use efficiency, and root physiology.

All are welcome  
Refreshments provided  
RSVP at [facebook.com/eswubc](https://facebook.com/eswubc)

Engineers for a Sustainable World's Spring Seminar "The Role of Engineers in Sustainable Food Production".



Engineers for a Sustainable World Members from UBC, University of Guelph, and Emily Carr University at the ESW General Conference in Atlanta, Georgia. UBC ESW students back row (R-L): Kevin Chen, Jackson Herron and Rosemarie Nederend.



## UBC BIOMOD

The UBC BIOMOD team, Cheeky Nanos, travelled to San Francisco for the annual international BIOMOD nanoscale design competition for college students. The team led by co-captains Siddharth Raghuvanshi (4th year CHBE) and Bridget La Prarie (3rd year CHBE), developed a project *DNA for Leukemia Treatment: An Antibody-Drug Conjugate Alternative* for the competition. BIOMOD competition deliverables included creating and executing a project, developing a website and video, and delivering a competition presentation. Cheeky Nanos met the project Gold Standard and was awarded 3rd place for their website and 3rd place overall. Congratulations to UBC BIOMOD Cheeky Nanos for their accomplishments.

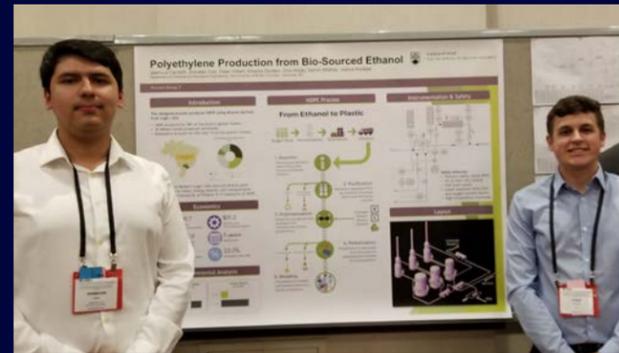
Acute Myeloid Leukemia (AML) is a type of cancer originating from hematopoietic stem cells (HSCs) in the bone marrow. Cheeky Nanos developed a DNA based antibody-drug conjugate (ADC) alternative a system to deliver doxorubicin, a common chemotherapy drug, to acute myeloid leukemia cells. To learn more about Cheeky Nanos' project and to watch their video, visit their website: <https://www.ubcbiomod.com/2018/project-ideas/>



The 2018 BIOMOD Cheeky Nanos developed a project *DNA for Leukemia Treatment: An Antibody-Drug Conjugate Alternative* for competition.

## CANADIAN SOCIETY OF CHEMICAL ENGINEERS (CSCHE) CONFERENCE

Robin Lai



Jhonatan Diaz (L) and Chris Krizay presented their Capstone project in the Hatch Student Design Competition at the CSChE Conference.

The **2018 CSChE Conference** took place in Toronto and several CHBE students attended. It was an incredibly enriching experience for the students. Robin Lai and Dana Mraz particularly enjoyed the student tour of Patheon's commercial pharmaceutical manufacturing operation. Ontario has a larger pharmaceutical industry than BC so this was an excellent opportunity to learn about and gain exposure to the pharmaceutical creation process. It was also very rewarding to be able to connect with other student leaders at the CSChE Conference, to learn about different campus cultures and to see what can be done at UBC CHBE to create a better student experience.

A Capstone team also travelled to Toronto to present their project in the Hatch Design Competition in the CSChE student program. Jhonatan Diaz Rosero and Chris Krizay presented "Production of High Density Polyethylene from Biologically Sourced Ethanol".

## WESTERN ENGINEERING COMPETITION

Steve Zhang

The Western Engineering Competition (WEC) is Canada's largest undergraduate engineering competition and is an annual, three-day event which involves 12 to 14 universities from western Canada. It was founded in 1985 to bring talented students together to practice and exhibit their problem solving, team-building and communication skills.

For the re-engineering category, teams of two students are challenged to enhance and optimize two case studies where new sets of constraints are applied. The teams participated in an intense 6-hour period of research, design, report-writing and presentation-preparation. At the end of the 6 hours, the teams present their case solutions to three judges and an audience.

A team of CHBE 4th year students, Shengyang (Steve) Zhang and Laurie Jiang, proposed production of bleach by electrochlorination of wastewater from a thermal desalination plate for Case 1, and proposed to use landfill gas as the new fuel source for thermal power generating plants in BC for Case 2. Both proposed solutions were determined innovative and sustainable by the judges and the CHBE team placed second out of 12 teams. The second place award qualified Steve and Laurie to participate in the Canadian Engineering Competition, hosted in Toronto. ■



Left to right: Anthony Ydenberg (WEC 2018 Chair), Shengyang (Steve) Zhang, Laurie Jiang, Evan Tsuji (Director of Re Engineering).

## UBC ENVISION

Jayg Dimayacyac



In 2017, members of the UBC Chem-E-Car team, excited about pursuing multiple other research projects, initiated Algae Bio-fuels, a project to optimize the cost of today's photobioreactors, and CHBeer, a project to create an automated brewing app for home brewers. Along with Chem-E-Car, these projects came to be the foundations of UBC Envision.

Throughout 2018, Envision has transformed into a source of professional development for CHBE students. As the American Institute of Chemical Engineers (AIChE) Student Chapter of UBC and possessing a relationship with the student chapter in Polytechnic University of Catalonia, Envision has a network of connections spanning outside of just Canada. It provides its members with opportunities to meet fellow chemical engineering undergraduate students and potential recruiters, as well as equip its members with the necessary technical and non-technical skills required of many engineers today.

UBC Envision hosts technical tutorials to build its members' skillsets. At the beginning of the term, Josh Donaldson, BioT member, delivered a tutorial about Python, successfully introducing members to the various libraries involved with the language and how to implement the code. At the end of the term, Matheus Cassol provided a tutorial on SolidWorks, walking through an intricate part with the members so they could explore the functions of the program. With these tutorials, members were able to get a brief introduction on several important technical skills and given the opportunity to continue learning at home.

Envision also hosts socials to strengthen the community within the organization, allowing members from different projects to share ideas and even invent new projects. A big component of Envision is project incubation and helping members bring their ideas to life. The new design project, Agrobot, is an example of Envision's support in developing new projects.

Envision member Brandon Chen was recipient of the AIChE UBC Freshman Recognition Award. At the regional Pacific Northwest conference, Jayg Dimayacyac was awarded 2nd place Research Paper for "Reducing Energy in Thermomechanical Pulp Production using Chlorine Dioxide". Both Brandon and Jayg were invited to the AIChE National Conference in Pittsburgh. Jayg Dimayacyac presented his paper at the National Conference in October 2018.



Members of Envision for 2018/19 academic year.

## UPCOMING EVENTS

Though it has grown significantly throughout 2018, Envision continues to look forward and offer new opportunities to the CHBE Department. With the goal of becoming the primary source of professional development in CHBE, **Envision is planning several events for the upcoming year:**

- Potential exchange program with Polytechnic University of Catalonia (UPC)
- Merchandise Sales (Envision T-shirts)
- Speakers' Series (LabView, Problem Solving)
- Chem-E-Jeopardy Competitions
- Industry Night Social
- Launch of Agrobot team



Envision Members showcasing projects at CHBE Open House.

## CHEM-E-CAR



UBC winning 1st place in National Chem-E-Car Poster Competition.

During April, UBC Chem-E-Car sent two teams for the second time in the team's history to the 2018 AIChE Pacific Northwest Regional Conference, held in Bozeman, Montana. Each team builds a shoebox-sized car, powered by an electrochemical battery and controlled by a chemical mechanism. Each team also had to create a poster to present the project to a team of adjudicators. During the Regional Competition, UBC was able to achieve the following:

- 1st Place for Chem-E-Car Regional Design Competition, UBC Team 1
- 3rd Place for Chem-E-Car Regional Design Competition, UBC Team 2
- 1st Place for Chem-E-Car Regional Poster Competition, UBC Team 2
- 2nd Place for Chem-E-Car Regional Poster Competition, UBC Team 1

After the successes of the Regional Competition, UBC Team 1 advanced to the National Competition. After extensive redesign of the car and poster, the UBC Chem-E-Car team took the top prize for their poster out of 39 teams at the 2018 American Institute of Chemical Engineering (AIChE) National Conference in Pittsburgh on October 28th. The team competed with their zinc-air battery powered car, Vancruiser, using an iodine clock reaction as their stopping mechanism.

**CHEM/E/CAR**

## BloT



BloT presenting fermentation apparatus at CHBE Open House.

From their presentation at the 2017 AIChE National Student Conference to getting written about by the Globe and Mail, BloT (formerly CHBeer) has had a plethora of successes since its inception. The goal of the team is to create an app that implements machine learning to set brewing conditions to produce better beer with specific style characteristics. BloT uses these machine learning algorithms to control temperature, pH and nutrient supply via basic sensors and controllers.

In November, BloT presented their work at Life Science Research Night. Their most recent work includes implementing their app to brew Belgian blondes using Magnum, Mt. Hood and Citra hops. The team is frequently collecting metrics, such as IBU (International Bitterness Unit) and ABV (alcohol by volume), from their brews to improve the app's calibration data. Such data is necessary to optimize the conditions to create higher quality beer that meet more defined characteristics. We continue to see vast improvements in their brewing app and are excited to see how far they can take it. But for now, there is still work to be done and more beer to be brewed!



## AGROBOT

After the Chem-E-Car National Competition, members of the Chem-E-Car team had another idea in their sights: a robot that could automatically perform strenuous and laborious agricultural tasks. Through collaboration with Envision, Agrobot applied for and received funding, secured a facility, and prepared a full recruitment process over the two months of November and December. In January of 2019, Agrobot officially launched, ready to take on one of Envision's most ambitious projects yet. We welcome Agrobot to the Envision family and are excited about what the team will achieve.

**AGROBOT**

## GREEN JOULE

Green Joule (formerly Algae Biofuels) aims to offset the production cost of algae biofuels through maximizing the potential of microalgae. To do so, the team has experimented with different techniques to optimize the fermentation process. One such method is to convert starch and cellulose in algae to fermentable sugars, which can then be converted to bioethanol via an ethanol producer, such as yeast. Green Joule has extensively studied the microalgae strain *Cholera vulgaris* and is testing various saccharification and fermentation conditions to optimize cost within its biofuel generation process. Green Joule has also initiated another project, the design of a plant light box system, in which food, light, CO<sub>2</sub> and space are available to optimize the growth of *Cholera vulgaris*. The design process involves integration of an automated light source, CO<sub>2</sub> delivery system and stirring mechanism.

During the year, Green Joule presented their research at the following conferences:

- Environmental Innovator's Award Academic Poster Competition
- Clean Energy BC Generate Conference
- Multidisciplinary Undergraduate Research Conference (MURC)

  
**GreenJoule**

# GRADUATE COUNCIL

## RESEARCH DAY

Research Day was staged on February 16th in the CHBE Building. The event featured an APSC 3 Minute Thesis (3 MT) competition, poster presentations and a key note speaker, Dr. Robert Messinger, from the CUNY Department of Chemical Engineering and the CUNY Energy Institute. Dr. Messinger's research covers a variety of topics, with a focus on materials study, chemistries, and device performance for energy applications. His presentation was on Molecular-Level Understanding and Design of Rechargeable Battery Materials. The 3MT workshops leading up to Research Day prepared students well for competition day. The competition was very popular and the presentations were very much appreciated by the audience.

**Co-Presidents: Haoqi Wang (PhD Candidate) and Daniel Korvin (MASC Student)**

The CHBE Graduate Student Club (GSC) is led by a group of executives who commit to contributing to a thriving, dynamic and positive CHBE community for graduate students. The GSC facilitates establishing connections and building successful relationships between students and others in CHBE. The GSC organizes social and professional development events and invites all Department graduate students to participate.

### SEPTEMBER "WELCOME DAY"

Early in September, a welcome event was hosted for new and returning students, faculty and staff. The ice was broken with a bagpipe performance by Dr. Jonathan Verrett. New students had the opportunity to meet key CHBE members and to become familiar with CHBE as their new home.

### FRIDAY COFFEE BREAK

What better way to end the week than by having a coffee with fellow research students after the Friday Graduate seminar! The Friday coffee breaks were enhanced this year by including theme days, integrating special holidays such as Persian New Year and Chinese New Year, which also reflected the cultural diversity of CHBE grad students.

### HALLOWEEN PUMPKIN CARVING CONTEST

The annual pumpkin carving event attracted many participants taking an evening break from their studies and research work.



### WINTER BREAK CELEBRATION

The GSC hosted a Winter Celebration at the Thea Koerner Graduate Student Center. Graduate students, faculty and staff enjoyed a catered dinner organized by a group of student volunteers.

# DEPARTMENT SCHOLARSHIPS

## THOMAS EDWARD JAMES BENNETT AWARDS

The Thomas Edward James Bennett Awards were endowed in 2012 as a legacy of Thomas Edward James Bennett, an accomplished alumnus of the Chemical and Biological Engineering Department who graduated in 2007. The awards honour his prodigious achievements in a life that ended too soon. His dedication and passion to "live life to the fullest and make a difference through sustainability" inspired many.



(L-R) Andrea Walus, Stephanie McKnight, Mary Kenny (mother of Thomas Bennett), Cathy Kenny, Marlene Chow, Dana Mraz, Jim Lim, Inez Tanu, Peter Englezos, Naoko Ellis at the Thomas Bennett award celebration.

The 2018 recipients, Dana Mraz and Inez Tanu, were selected for their active interest in student enrichment activities, social and environmental concern, academic achievements and leadership qualities.

## CHAD BENNINGTON MEMORIAL SCHOLARSHIP

The Chad Bennington Memorial Scholarship is named in memory of Professor Chad Bennington, a faculty member in the Department of Chemical and Biological Engineering. Scholarships are awarded to students who demonstrate interest, leadership and academic accomplishment in pulp and paper related technologies. The 2018 recipients of the Chad Bennington Scholarship are Inez Tanu and Sarah Seyed Mahmoud.

## THE JOEL BERT MEMORIAL SCHOLARSHIP

Dr. Joel Bert was a UBC faculty member for over twenty years in the Department of Chemical and Biological Engineering. The scholarship is awarded to an undergraduate student in the final year of Chemical and Biological Engineering, with preference given to those with an interest in applying engineering principles to human health concerns. The recipient, Marina Najm, is a Chemical and Biological Engineering student with a minor in Entrepreneurship.

## GRACE MENTORSHIP AWARD IN CHEMICAL AND BIOLOGICAL ENGINEERING

The Grace Mentorship Award in Chemical and Biological Engineering was endowed by Dr. John Grace, the Department of Chemical and Biological Engineering and the Faculty of Applied Science. The award is offered to a graduate student or post-doctoral fellow, who has been highly effective in mentoring undergraduate students in the Department. Lius Daniel, Doctoral Candidate supervised by Dr. David Wilkinson was the 2018W recipient of the Grace Mentorship in Chemical and Biological Engineering recognizing his mentorship of undergraduate students in the Wilkinson research lab and his work as a teaching assistant.

## JOHN R. GRACE GRADUATE SCHOLARSHIP IN CHEMICAL AND BIOLOGICAL ENGINEERING

The John R. Grace Graduate Scholarship in Chemical and Biological Engineering was endowed in honour of Dr. John R. Grace by his wife, Dr. Sherrill E. Grace, for graduate students in Chemical and Biological Engineering who demonstrate academic excellence and potential for service to society by performing research on energy, the environment, and/or multi-phase systems. Ehsan Espid, doctoral candidate supervised by Dr. Fariborz Taghipour, received the 2018W award. Ehsan's PhD project focused on the development of a new generation of ultraviolet light emitting diode (UV-LED) photocatalytic sensors for air monitoring.

## HEAD OF CLASS ENGINEERS AND GEOSCIENTISTS OF BRITISH COLUMBIA (EGBC) PRIZE IN ENGINEERING

The Head of Class Engineers and Geoscientists of British Columbia (EGBC) Prize in Engineering is awarded to the top engineering student in the Faculty of Applied Science. Sean Bonnett (CHML) received the EGBC award for the Class of 2018. Sean is the first CHBE department student to receive this award.

## NORMAN EPSTEIN AWARD

The Norman Epstein Award was established by Henry Wakabayashi to honor Dr. Norman Epstein who was his professor in 1958. The award is provided to support a 4th year student who shows diligence in the fundamentals of Chemical Engineering demonstrated through their projects and courses. Athanasios Kritharis received the 2018 award in recognition of his participation in student teams, Innovation OnBoard, and other projects.

## HELSA LEONG MEMORIAL GRADUATE AWARD IN CHEMICAL AND BIOLOGICAL ENGINEERING

Family and friends established a graduate award in memory of Mrs. Helsa Leong, who was a staff member for over thirty-five years in the Department of Chemical and Biological Engineering and a pillar of the graduate programs within the department. The award is offered to an outstanding graduate student in Chemical and Biological Engineering, with preference given to those who have demonstrated leadership and community service. Vasili Triandafilidi, doctoral candidate supervised by Dr. Hatzikiriakos, was the recipient of the first Helsa Leong Memorial Award in recognition of his leadership and participation in establishing Innovation OnBoard, which provides students with opportunities to about develop entrepreneurship skills, and in the Open Learning project which provide students with tools to enhance their learning.

# DESIGN DAY

CHBE 4th year students complete a Capstone Project, a significant plant design project, over an eight-month period. This project involves collaborating with industry and community groups on real-world problems and scenarios under the guidance of faculty members. The capstone projects topics reflect the innovativeness of students!

## GROUP PROJECT

**B1:** Production of Phycobiliproteins using *Porphyridium Cruentum*

**B2:** Craft Brewery Scale Up

**B3:** Production of n-butanol from Carbon Dioxide Using Engineered Cyanobacteria

**P1:** Synthetic Natural Gas Production from Biomass Gasification

**P2:** Treatment of Sour Water and Condensate Generated from Natural Gas Well Production

**P3:** Methanol Production from Captured Associated Petroleum Gas

**P4:** Pyrolysis of Waste Wood: Production of Bio-oil and Biochar

**P5:** Synthesis of Petroleum Products from Waste Plastic

**P6:** Synthesis of Dimethyl Ether from Douglas Fir

**P7:** Production of High Density Polyethylene from Biologically Sourced Ethanol

**P8:** Dimethyl Ether Production from Natural Gas

**P9:** Hydrogenolysis of Crude Glycerol into Bio-Propylene Glycol

**P10:** Production of Biodiesel from Waste Vegetable Oil



Philip Ireri discusses the P6 project *Synthesis of Dimethyl Ether from Douglas Fir* with judge, Dr. Robert Legros.

Photo Credit: Kai Jacobson

The Capstone Projects were displayed and presented by the students for public viewing and judging by industry professionals during the APSC Design and Innovation Day on April 4th, 2018. The Design and Innovation poster judging was followed by a networking reception hosted by the Applied Science Dean's Office. CHBE Capstone groups B3, P1, P2 and P9 were awarded Design and Innovation Industry Poster prizes at the reception.



Bio-based processes were of interest to the public and Amanda Goossen explains polyethylene from bio-sourced ethanol.



Paul Chen, Nicole Farry, Michael White confer with alumni and Judge, Ray Randall, on their project *Synthesis of Dimethyl Ether From Softwood*.



Students discuss their project, *Production of High Density Polyethylene from Biologically Sourced Ethanol*.



Claudio Arato judging (left to right, facing camera) Cladio Arato, Michelle Zhou, Laurie Jiang.

Photo Credit: Kai Jacobson

# CAPSTONE AWARDS

## APPLIED SCIENCE DESIGN AND INNOVATION AWARD PROCESS PROJECT

### P9: BIO-PROPYLENE GLYCOL FROM CRUDE GLYCEROL

Group P9 (left to right in photo): Dilem Tuzcu, Liam Muir, Sean Bonnett, Aliya Mitchell, William Gumboc. (Not pictured: William Xi, Enakshee Charitar.)



Photo Credit: Tony Wu



## APPLIED SCIENCE DESIGN AND INNOVATION AWARD PROCESS PROJECT

### P2: TREATMENT OF SOUR WATER AND CONDENSATE GENERATED FROM NATURAL GAS WELL PRODUCTION

Group P2 (left to right): Asia Chu, Justin Dulce, Nolan Okrusko, Edmund Ong, Garrett Cahill, Heather Kee, Tony Wu.

## APPLIED SCIENCE DESIGN AND INNOVATION AWARD PROCESS PROJECT

### P7: PRODUCTION OF HIGH DENSITY POLYETHYLENE FROM BIOLOGICALLY SOURCED ETHANOL

Group P7 (left to right): Jean-Luc Candolfi, Amanda Goossen, Jhonatan Diaz, Chris Krizay, Joshua William Nurdjaja, Owen Gilbert, Samim Mokhtar.



Photo Credit: Eric Jia

## APPLIED SCIENCE DESIGN AND INNOVATION AWARD BIOPROCESS PROJECT

### B3: N-BUTANOL PRODUCTION USING ENGINEERED CYANOBACTERIA

Group B3 (left to right): Michael Chang, Sarah Rajani, Marc Caruth, Bowen Liu, David Gurr, Amir Meysami Fard, Bryce Difley.



Photo Credit: Eric Jia



Professor Paul Watkinson presents the people's choice poster award.

## CHEMICAL AND BIOLOGICAL ENGINEERING DEPARTMENT PAUL WATKINSON BIOPROCESS AWARD

### P1: BIO-SYNTHETIC NATURAL GAS PRODUCTION FROM WASTE BIOMASS

Group P1 (left to right): Sheida Arfania, Xiaoyi Liu, Cindy Ngaserin, Shengyang Zhang, Hui Min (Laurie) Jiang, Mo (Michelle) Zhou. (Not pictured: Abdulrehman Shaukat.)



Photo Credit: Eric Jia

## CHEMICAL AND BIOLOGICAL ENGINEERING DEPARTMENT 6TH INT'L CONFERENCE ON GAS HYDRATES (ICGH 2008) AWARD AND COLIN OLOMAN PEOPLE CHOICE POSTER AWARD

### B2: CRAFT BREWERY SCALE UP

Group B2 (left to right): Dionysios Kourouniotis, Chella Thorton, Alyssa Limmerna, Hongxuan Zhang, Xiangwen Cui, Yiting Zhang, Athanasio Kritharis, (Not pictured: Zhengyang Li.)



# APSC RISING STARS

The stars of UBC Applied Science are people passionate about their chosen field—architecture, landscape architecture, community and regional

planning, engineering and nursing—and those that inspire others by making meaningful contributions to the betterment of society. Congratulations to the following Chemical and Biological Engineering graduates who are part of the 2018 APSC Rising Stars.



**AMIR REZA MEYSAMI FARD**  
(BASc '18, CHBE)

"What I have learned from engineering is that it is possible to find solutions for all problems, but each problem requires time and effort. Success stories are made through putting in that extra bit of work."



**CHELLA THORNTON**  
(BASc '18, CHBE)

"Participate in events, join teams, make friends, take some "me time" and have fun! School may come first, but you should set some time aside for yourself."



**ANDREW SHEROUBI**  
(BASc '18, CHBE)

"The lesson was to fail faster. Failures provide the best avenues for growth and for learning."



**ONYINYE OFULUE**  
(BASc '18, CHBE)

"Engineering trains your brain to work in a problem-solving mode, helpful in applying technical knowledge and excelling in other avenues of your professional career."



**ANGELICA REYES**  
(MASc '18, CHBE)

"Do something you are passionate about. Passion will keep you going when experiments fail (and trust me they will) or when it gets stressful and frustrating in the lab for other reasons."



**TONY WU**  
(BASc '18, CHBE)

"The most valuable lesson that I have learned is to create opportunity where opportunity doesn't exist."



**ATHANASIOS (THANOS)  
KRITHARIS**  
(BASc '18, CHBE)

"Join design teams early, enter as many competitions as possible, and make the most of your time here."

Photo Credit: Clare Kiernan

# STUDENT AWARDS

**RECIPIENT:** MEHR NEGAR MIRVAKILI,  
PHD CANDIDATE

**AWARD:** 1ST PLACE IN THE GRADUATE  
STUDENT POSTER COMPETITION

**ORGANIZATION:** CANADIAN SOCIETY  
OF CHEMICAL ENGINEERS, 2018  
CONFERENCE

Mehr Negar Mirvakili presented a paper and a poster at the CScE conference in Toronto. She received the award for her poster "Effect of Surface Wettability on Optical Properties of Casted Microfibre Cellulose Films".

Dr. Negar Mirvakili was also a recipient of one of two BioProducts Institute Rising Star Graduate Awards. Dr. Mirvakili successfully defended her PhD in Chemical and Biological Engineering in late December 2018. She also earned her BASc and MASc in Chemical and Biological Engineering at UBC.

**RECIPIENT:** RUIXI WANG, PHD  
CANDIDATE, AND ZILIANG WANG,  
POSTDOCTORAL FELLOW

**AWARD:** 1ST PLACE POSTER

**ORGANIZATION:** UBC BIOPRODUCTS  
INSTITUTUE

Ruixu Wang and Ziliang Wang were awarded first place prize for their poster "Performance of a prototype pulsed fluidized bed reactor for biomass residues torrefaction".

**RECIPIENT:** ERIC DENNING JIA,  
POSTDOCTORAL FELLOW

**AWARD:** 2ND PLACE POSTER

**ORGANIZATION:** UBC BIOPRODUCTS  
INSTITUTUE

Eric Denning Jia was awarded second place prize presenting his poster "Heat and mass transfer in pulsation-assisted fluidized beds".

**RECIPIENT:** AMIR KASHANI, UBC MASC

**AWARD:** CANADIAN BLUE SKY YOUNG  
RESEARCHERS INNOVATION AWARD

**ORGANIZATION:** FOREST PRODUCTS  
ASSOCIATION OF CANADA (FPAC)

The Blue Sky award objective is to advance innovation in the forest sector by engaging young and talented students and researchers through initially a national competitive process followed by an international competition. Amir, an MASc student and member of the UBC BioFoundry, led by Dr. Vikram Yadav, is researching the biovalorization of lignin.

"It is a true honour for me to represent Canada in this competition," said Kashani. Being recognized for research activities that are also a personal passion is really gratifying."

**RECIPIENT:** DANIELLE SALVATORE,  
CHBE PHD CANDIDATE

**AWARD:** CLEAN ENERGY RESEARCH  
FOUNDATION AWARD

**ORGANIZATION:** TYLER LEWIS CLEAN  
ENERGY RESEARCH FOUNDATION

The Tyler Lewis Clean Energy Research Foundation was established to honor the memory of CHBE graduate student Tyler Lewis, who was passionate about the environment and sustainability. Danielle, supervised by Dr. Curtis Berlinguette, is the first UBC student to receive a Tyler Lewis Award.

**RECIPIENT:** ANDREW SHEROUBI,  
BASC 2018

**AWARD:** JOHN GIBBARD MEMORIAL  
AWARD

**ORGANIZATION:** UNITED NATIONS  
ASSOCIATION IN CANADA VANCOUVER  
REGION BRANCH

Andrew Sheroubi created and led a student directed a full 3-credit course Humanitarian Engineering in 2017W under the supervision of Dr. Gabriel Potvin. The goals of this course were to train engineers to be more globally minded and aware of the context and underlying factors behind humanitarian and social issues. It also aimed to provide an avenue for students to apply their technical knowledge towards addressing some of the problems in the world. The course covered topics from political science and international development as well as technical knowledge on three streams: food, energy, and water security.

For the final design project, students were grouped into multidisciplinary teams and chose a problem statement provided by non-profits and charities from around the world. These were real-life technical problems that the organizations were facing. Along with working on a solution, the teams had to analyze the underlying issues that the organizations were trying to address.

Andrew was extremely proud and happy with the student work and the organizations felt the same. All the organizations are using the final project reports in some capacity. For Andrew, the course was easily the highlight of his university career

## GRADUATION DAY

CHBE's Spring Graduation Day was on May 30th, 2018. The graduating class lined up to don their gowns and caps and then filed into the Chan Centre. Crowds of friends and loved ones cheered as each student's name was called and as they walked across the stage with their diploma to shake the hands of Dr. James Olson, Dean of Applied Science, and of Dr. Santa Ono, President of UBC. After enjoying cake and taking photos in the sunshine out by the Rose Garden, CHBE students and their families trekked across campus to the awards and reception held at the CHBE building.

## TEACHING AWARDS

Students nominate faculty to receive Teaching Awards, acknowledging their excellence in teaching and assisting students achieve their potential in their undergraduate programs.

Dr. Gabriel Potvin and Dr. S. Alireza Bagherzadeh were both awarded 2018 the CHBE Teaching Excellence Award.



Dr. Gabriel Potvin



Dr. S. Alireza Bagherzadeh

# GRADUATION REMARKS

**Michelle Zhou, November 2018**

Mr. Chancellor, Mr. President, Deans, distinguished Faculty members, honored guests, family and friends, fellow graduates, thank you all for coming. First of all, I'd like to take a moment to congratulate the graduating class of 2018, please give yourself a round of applause everyone, you've made it, and you deserve this.

A friend of mine once told me "Pain is fear leaving your body," and I've remembered it since. I am sure we've all had countless experiences dealing with pain. The painful exam weeks, painful failures, painful hardships, and various degrees of painful headaches from caffeine overdose. But luckily, what doesn't kill us only makes us stronger. In fact, surviving through the pain actually makes us less afraid today than ever before. To me, this is a praiseworthy accomplishment in itself, because it signifies that you and I are ready to be tomorrow's leaders, that we are ready for change that requires sacrifice, and most importantly, that our visions will lead us, unperturbed, on the pathway toward something great and beneficial to societies and generations to come.

This said, and echoing UBC's vision of cultivating an inclusive community with diverse backgrounds, I am pleased to announce the AMS graduating class of 2018 gift: a commissioned LGBTQTTI (pride and trans) art installation which has already been installed outside the NEST. The goal is to foster inclusivity by proclaiming UBC and UBC's public spaces as positive spaces. In addition, the gift will also provide financial support to each of the undergraduate societies in order to promote campus-wide student engagement. The total value of the gift is \$20,000.

Going forward, we will continue to thrive through pains in many aspects of our lives, whether that be in our professions, education, or personal relationships. But I urge you to embrace those pains, as we look back fondly at our time at UBC and remember that fear can be overcome. Once again, Congratulations to the graduating class of 2018.



Michelle Zhou.

Photo Credit: Grad Image



Photo Credit: Grad Image

## CLASS OF 2018

Welcome, Class of 2018, to your new and celebrated place among more than 3,500 CHBE alumni around the world. We are honoured to have given you a place to discover, to inspire others and to be challenged beyond what you thought was possible. We hope you remember that we will always be that place for you.

### THE DEGREE OF BACHELOR OF APPLIED SCIENCE IN CHEMICAL ENGINEERING

- Mohamed Al Mahmeed
- Faisal Anees
- Sheida Arfania
- Pranav Bajaj
- Sean Bonnett
- Ralph Boustros
- Garrett Cahill
- Jean-Luc Candolfi
- Krit Charoenpanon
- Annie Chen
- Paul Chen
- Zhiyang Chen
- Asia Chu
- Jianyi Deng
- Jhonatan Diaz Rosero
- Justin Dulce
- Nicole Farry
- Fang Ee Foo
- SiWei Gao
- Owen Gilbert
- Amanda Goossen
- William Gumboc
- Derek Ha
- Megan Hall
- Amir Mohammad Heydar

- Charley Huang
- Philip Ireri
- Hui Min (Laurie) Jiang
- Abhijeet Kamble
- Jasnoor Kaur
- Heather Kee
- Christopher Krizay
- Ruiwen Li
- Tao Li
- XiaoYi Liu
- Eric Loong
- Amanda Melney
- Chaoyi Meng
- Aliya Mitchell
- Samim Mokhtar
- Liam Muir
- Alexander Murdock
- Mohammed Aabid Najmul Hussain Mulla
- Cindy Ngaserin
- William Nurdjaja
- Onyinyechukwu Ofulue
- Nolan Okrusko
- Edmund Ong
- Ahmed Qatan
- Elaine Yin Leng Quek
- Abdul Rehman Shaukat
- Haren Naresh Teckchandani
- Harsh Teckchandani
- Carolyne Tran
- Haruka Tsuemoto

- Dilem Tuzcu
- Bissultan Umbet
- Pulkit Verma
- Michael James White
- Forrest Wight
- Gregory Wimmer
- Tong Wu
- Wang Xi
- Peijun Ye
- JiaYi (Tony) Zhang
- Shengyang (Steve) Zhang
- Yuqian Zhang
- Mo (Michelle) Zhou
- Wei Hang Zuo

### THE DEGREE OF BACHELOR OF APPLIED SCIENCE IN CHEMICAL AND BIOLOGICAL ENGINEERING

- Sanjana Akella
- Claire Armour
- Marc Caruth
- Michael Chang
- Yow-Rong Chang
- Xiangwen Cui
- Bryce Difley
- Quanting Guo
- David Gurr
- Gabrielle Jayme

- Dionysios Kourouniotis
- Athanasios Kritharis
- Alyssa Limmema
- Bo Wen Liu
- Jian Shu Liu
- Amir Reza Meysami Fard
- Prangthip Prakobkit
- Deepali Prasad
- Sarah Rajani
- Jamie Samuel
- Abhivir Sandhu
- Andrew Sheroubi
- Chella Thornton
- Li Jie Ti
- Hao Xiong
- Edbert Yeung
- Hongxuan Zhang
- Yiting Zhang
- Yimeng Zhao
- Yuting Zhou

### THE DEGREE OF MASTER OF APPLIED SCIENCE IN CHEMICAL AND BIOLOGICAL ENGINEERING

- Siddharth Bhartia
- Chun Haow Kung
- Yuhao Nie

### THE DEGREE OF MASTER OF ENGINEERING IN CHEMICAL AND BIOLOGICAL ENGINEERING

- Nida Riza
- Dijia Wu
- Qushen (Shirley) Zhang
- Daniyar Zhussupov

### THE DEGREE OF DOCTOR OF PHILOSOPHY IN CHEMICAL AND BIOLOGICAL ENGINEERING

- Hasti Hosseinizand
- Yu (Max) Wan



Photo Credit: Eric Jia



### GRADUATION PROGRAM AND RECEPTION

Following the UBC spring graduation ceremony, graduates and their families and friends are invited to a graduation program followed by a reception in the CHBE building. The program included presentation of Capstone Awards and a student slide show created by Tony Wu. Students also presented the teaching excellence awards to Dr. Potvin and Dr. Bagherzadeh.

## CLASS OF '88

**Phillip Choi, Ph.D., P. Eng., F.C.I.C. | Professor |**

The reunion for the chemical engineering class of 1988 took place on the UBC Vancouver campus during the 2018 homecoming weekend. It was delightful to see a total of fourteen classmates along with a few guests who were in attendance to celebrate our 30th anniversary. In the morning, we gathered in the foyer of the Chemical and Biological Engineering (CHBE) building and shared our experiences from our careers and personal lives.

Professors Branion, Epstein, Meisen and Watkinson who had taught the class joined us during the Dean's Homecoming BBQ lunch which was held at the Engineering Student Centre. It was amazing to all of us that Professor Epstein, well into his nineties, continues to work every day. After the BBQ lunch, we took a tour of the CHBE building which was organized by Ms. Marlene Chow who is currently the Director of Academic Programs, Administration and Facilities of the Department. She arranged for us to meet with a group of current undergraduate students. They enthusiastically shared their Chem-E-Car and student life experiences with us. It was gratifying to learn that the Chem-E-Car team finished at the 2nd place in a recent international Chem-E-Car competition.

Ms. Chow also showed us the computer lab as well as various undergraduate and research labs. The facilities are impressive. After the department tour, we strolled over to the new Robert H. Lee Alumni Centre followed by a stop at the Mahony & Sons Public House for beer. The reunion concluded with a dinner at the Westward Ho Restaurant located inside the UBC Golf Club. Everyone enjoyed the dinner and the company of each other. And we will definitely do another reunion in 2023.



Class of '88 Reunion.

## CLASS OF '93

Jillian Cooke coordinated the Class of '93 reunion on May 18th and 19th with Tara Newell, APSC Alumni Engagement. It was attended by 90% of the class members who traveled from various BC communities, Singapore, Hong Kong and across Canada!

The class met for a few brews on Friday evening and continued their reunion with a CHBE building visit on Saturday. Peter Englezos, Head, welcomed the Class reminding them about the courses that he taught them. During the visit, the Class compared notes to their experiences in the old CHBE building and viewed some familiar equipment in the undergraduate teaching labs! The Class also met with the Chem-E-Car team to hear about their projects and competition.

The Class of '93, capped their weekend with a dinner in the Engineering Student Centre Saturday evening which included a Now and Then slide show. The reunion was filled with reminiscing and laughter. Class members are a diverse group with occupations including researcher, physician, investment broker, supervisors, managers, consultant, engineering and a teacher. The Class of '93, with fond memories of their own field trip experiences, generously donated \$10,000 to support the annual 3rd year field trip.



Class of '93 Reunion.

## CLASS OF '58



Chemical Eng photo from the Engineering 1958 Reunion. Chemical Engineering: Henry Wakabayashi, Craig Clark, Martin Kylo, Seated: Professor Norman Epstein.

The engineering class of 1958 held a reunion during Homecoming Weekend. During the reunion, three members of the class met with Dr. Norman Epstein to reminisce.

# CHBE INDUSTRY ADVISORY COUNCIL

## Our current IAC members:

<b>Claudio Arato</b>	Chief Technology Officer, Provectus Engineered Materials
<b>Clive Brereton</b>	Vice President of Technology, Noram Engineering and Constructors Ltd.
<b>Alfred Guenkel</b>	Partner and Principal Chemical Engineer, Noram Engineering and Constructors Ltd.
<b>Doris Haim-Galvez</b>	Senior Vice President, Project Development, HATCH
<b>Eric Jervis</b>	Principal Scientist, Stem Cell Technologies
<b>George Peat</b>	Executive Director, GERM MAX
<b>Martin Pudlas</b>	Vice-President Operations, Canfor Pulp and Paper
<b>Tim Watson</b>	Past Senior Vice President, Project Development, Teck Resources
<b>Peter Wynne</b>	Senior Process Engineer, Parkland Refining Ltd.

Leading the CHBE Industry Advisory Council (IAC) as co-chairs are Tim Watson and Dr. David Wilkinson, Professor, Tier 1 Canada Research Chair.

For the 2018W academic year, the IAC focused focus on a theme, "Curriculum and Program Change for our Undergraduate and Graduate Engineering Students."

- First and second year curriculum and program change in CHBE
- Third and fourth year curriculum change in CHBE, and the importance of clubs and extracurricular activities
- Change in graduate programs in CHBE (PhD, MAsC, and MEng)

The IAC meetings also provide opportunity for industry to develop a better understanding of CHBE faculty research efforts.

IAC members also participate in numerous ways. Tim Watson participated in the Department External Review in 2018, Claudia Arato actively supported the Innovation OnBoard team. Members are regular participants at student industry events and guest speaker.

# HEALTH AND SAFETY

## Miles Garcia

During 2018, UBC formed Joint Occupational Health and Safety Committees (JOHSC) including one in Applied Science. The department safety committee became the CHBE-CERC Local Safety Team and has membership in the APSC JOHSC. Membership in the JOHSC provides benefits in coordinating health and safety standards within the faculty and the opportunity to bench mark best practices.

The CHBE Department Local Safety Team includes faculty, staff, and students who meet monthly to discuss Health, Safety and Environmental issues, opportunities for improvements, and to review any safety incidents that have occurred.

## Our 2018 committee members include:

David Wilkinson (Co-chair)	Marlene Chow (Co-chair)
Miles Garcia	Serge Milaire
Dhanesh Kannangara	Sarah Chen
Jonathan Doan	Jeremy Rochussen
Gladys Conroy	Roza Ghaemi
Damoon Ranjbar	

## 2018 Local Safety Team projects included:

- Implementing improved experimental equipment safety audit process in collaboration with the CHBE Machine Shop with a requirement for submission of P&ID, PFD, HAZOP, & SOP before the procurement, fabrication, assembly and installation of new equipment. This new process should minimize cost and time inefficiencies, as well as improve safety.
- Improved management of inventories for lab equipment and chemicals.

The LST is pleased to work with all faculty, students, staff and visitors to ensure a safe working and learning environment in the CHBE department.

## PROFESSOR ROBINSON OBITUARY

Professor Emeritus Campbell William Robinson passed away on October 18, 2016. He was a Professor in the Department of Chemical Engineering at the University of Waterloo from 1971 - 1996 and was part of the Biochemical Engineering research group.

Professor Robinson was the Founding Director of the Biotechnology Research Centre at the university and was also an Editor Emeritus for the Canadian Journal of Chemical Engineering, as well as a graduate of the UBC Chemical Engineering program.

He generously donated \$5,000 to the CHBE department in his estate.



Professor Emeritus Campbell William Robinson.

# UBC ALUMNI BUILDERS AWARDS

Created in 2017 as part of the 100th year of alumni UBC, the Alumni Builder Award recognizes a cross section of alumni representing all faculties who have significantly contributed to the University and enriched the lives of others, and in doing so, have supported alumni UBC's mission of realizing the promise of a global community with shared ambition for a better world and an exceptional UBC. We are proud to announce that Tim Watson and Claudio Arato were honoured as 2018 Alumni Builder Award recipients. Claudio was recognized for his enduring contributions to the Chemical and Biological Engineering students, the UBC Faculty of Applied Science and the engineering community of British Columbia. Tim was recognized for his active support and advocacy of engineering education and programs at UBC. Tim and Claudio received the awards at the Applied Science Celebration in April, 2018.

## CLAUDIO I. ARATO (BSc'89, BAsC'91)



Claudio receives an Alumni Builders award from Dean James Olson and Provost Andrew Szeri.

Photo Credit: Martin Dee

## TIM C. WATSON (BAsC'82)



Tim receives an Alumni Builders award from Dean James Olson and Provost Andrew Szeri.

Photo Credit: Martin Dee

# UBC PROFS **RICHARD KEREKES** AND **JOE ZHAO** GIVE PRESENTATIONS AT CHINA PAPER CONFERENCE

Professor Emeritus Richard Kerekes and Adjunct Professor Joe Zhao of UBC's Chemical and Biological Engineering gave three presentations at the China International Paper Technology and Exhibition Conference held in Shanghai China on August 28-30, 2018.

Dr. Kerekes gave two technical papers co-authored with Joe Zhao and Dave McDonald of JDMcD Consulting Inc, one paper on energy savings in wet pressing and the other on uniformity in pulp refining. In a related session, the 2018 China International Paper Innovation and Development Forum, Dr. Zhao gave an overview of the state of the paper industries in North America and China, focusing on trends and opportunities.

The International Paper Technical Conference is a professional platform for papermakers to exchange and understand the achievements and development trends of paper industry. The 2018 Conference was jointly organized by China Technical Association of Paper Industry, China National Pulp and Paper Research Institute Co., Ltd, and the Forest Products Engineers of Finland. Invited experts from China, Finland, Canada, gave presentations on R&D hot spots in pulping, papermaking and relevant industries.

Drs. Dick Kerekes and Joe Zhao presented papers at China International Paper Technical Conference in Shanghai, China in August 2018.



# WELCOMING VISITORS

Annually CHBE faculty, students and staff welcome and host hundreds of visitors during the APSC open house and other events. 2018 was no exception with visits from St. John's high school, Steveston-London High School, Grade 9 Math Challengers and Future Global Leaders. Visiting groups meet CHBE students and student teams to view their projects and learn about life as a CHBE student, hear about Department research, tour the undergraduate teaching labs for demonstrations and are treated to liquid nitrogen ice cream!



Dr. Gabriel Potvin and a volunteer demonstrate heat transfer in the undergraduate teaching lab.



CHBE visitors are treated to liquid nitrogen ice cream.

# RIDE FOR CLEAN ENERGY

Sean McBeath

The sixth annual Ride for Clean Energy took place on August 11th, 2018, once again setting a new record for largest number of riders. This year's event had 53 riders and one additional participant who rode remotely; taking on a 90 km route starting in Sopron (Hungary) and ending in Vienna (Austria).

The Ride is set as the **Tyler Lewis Clean Energy Research Foundation's** primary annual fundraiser and once again proved itself as just that by raising over \$20,000 for the third consecutive year. All the funds raised go directly to the Foundation and are crucial for the continued issuing of their research grants. The foundation was started in memory of Tyler Lewis, a former CHBE PhD student, who tragically passed away in 2012.



Ride for Clean Energy Group Participants.

As usual, the CHBE Department boasted an impressive presence at the Ride for Clean Energy, including current CHBE Department members Adrian Serrano, Ruben Govindarajan, Bill Cheng and Dr. Jonathan Verrett. Representing the CHBE alumni at this year's ride included Dave Bruce, Dawn Barreira, Kareem Fakhfakh and Sean McBeath.

The Foundation would like to thank everyone who participated in this year's ride, as well the ongoing support from CHBE. Planning for the 2019 Ride for Clean Energy is well underway and is scheduled to take place on Saturday August 10th, 2019!

For more information on the foundation or the Ride, visit their websites.

Tyler Lewis Clean Energy Research Foundation: [www.tylerlewis.ca](http://www.tylerlewis.ca)

Ride for Clean Energy: [www.rideforcleanenergy.com](http://www.rideforcleanenergy.com)



# SANOBI BIOGENIUS COMPETITION

The Faculty of Applied Science and Department of Chemical & Biological were pleased to host the 2018 British Columbia Regional Sanofi Biogenius Competition (SBC) on April 19th in the CHBE atrium. The SBC biotechnology competition ([www.biogenius.ca](http://www.biogenius.ca)), organized by Partners in Research (PIR), matches high school students with research faculty mentors to complete amazing research projects. Past elite research project topics have ranged from cancer and Alzheimer's disease, to agriculture and the environment. Many ideas have been patented and

commercialized, garnering international media attention. UBC faculty have participated as mentors and evaluators. The competition featured 11 high school students from the Lower Mainland and Vancouver Island. Janet Fraser, Vancouver School Board Chairperson opened the awards ceremony and Dr. Vikram Yadav welcomed the students to UBC.

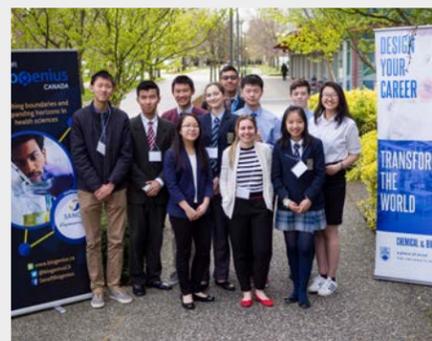


Photo Credit: Clare Kiernan and Anjali Bhatt

# 2018/19 DISTINGUISHED SPEAKER SERIES

The Distinguished Speaker Series invites Canadian and international researchers outstanding in their field to give presentations in the Department.

More information about the series can be found on our website, [chbe.ubc.ca/news-events/speaker-series/](http://chbe.ubc.ca/news-events/speaker-series/)

The public is welcome to attend the distinguished speaker seminars.



## LIANG-SHIH FAN

Friday, October 5th, 2018

Professor, Ohio State University

Chemical Looping Combustion, Gasification and Reforming: Perspectives in Commercialization Readiness



## JOE QIN

Friday, October 26th, 2018

Professor, University of Southern California

Process Data Analytics for Troubleshooting of Feedback Controlled Manufacturing Plants



## H. SCOTT FOGLER

Friday, November 30th, 2018

Professor, University of Michigan

Teaching Problem Solving, Troubleshooting and Critical and Creative Thinking in Chemical Engineering



## LINDA NAZAR

Friday, January 25th, 2019

Professor, University of Waterloo

Electrochemical Energy Storage for a Low Carbon Future



## EMILIE DRESSAIRE

Friday, March 22nd, 2019

Professor, University of California, Santa Barbara

Driving Flow in Confined Environments: From Convection to Elasticity

## SPECIAL SEMINAR:

### DOUG REEVE

Wednesday, November 28, 2018  
Professor, University of Toronto

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