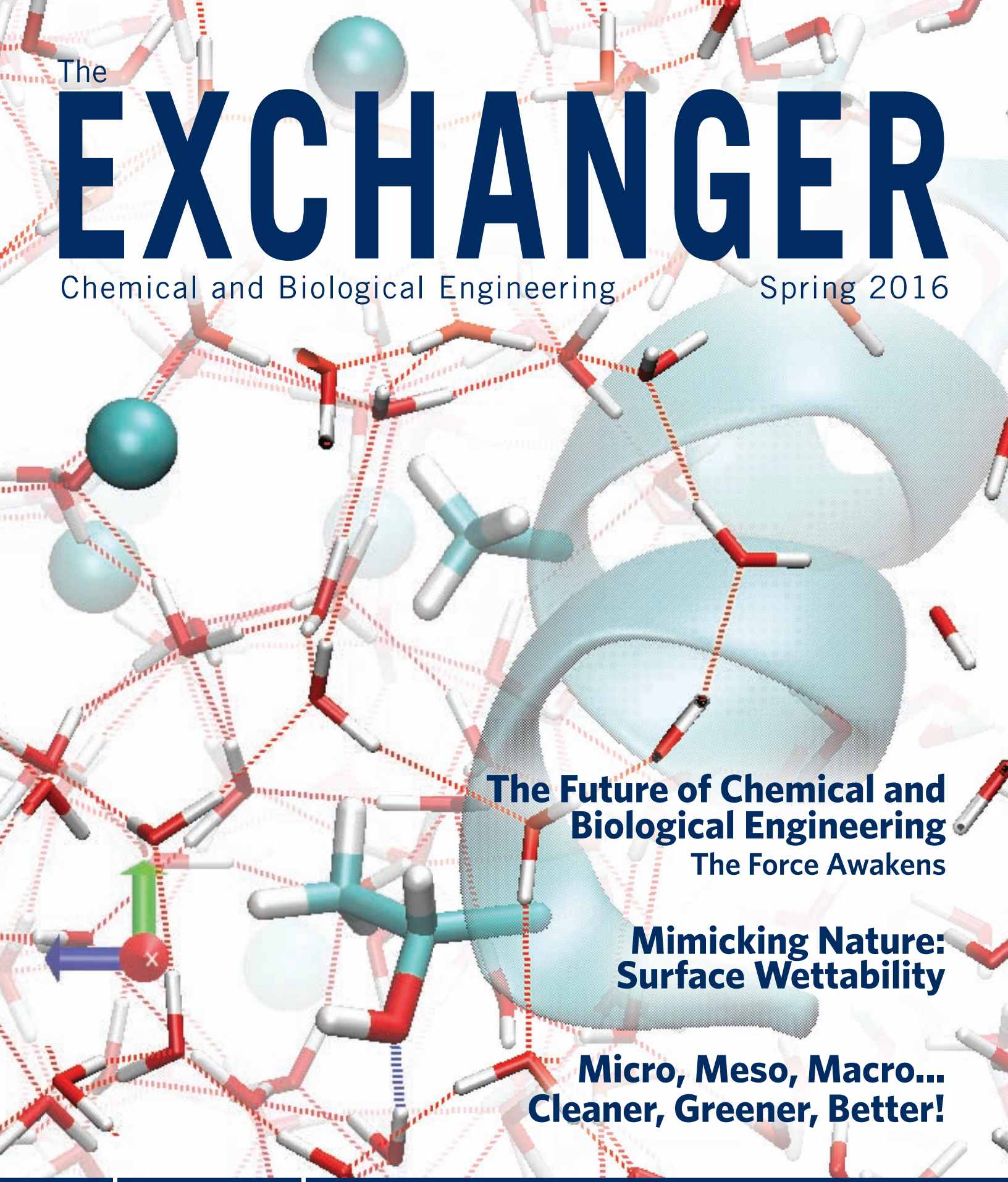
The

EXCHANGER

Chemical and Biological Engineering

Spring 2016



The Future of Chemical and Biological Engineering

The Force Awakens

Mimicking Nature: Surface Wettability

Micro, Meso, Macro... Cleaner, Greener, Better!

a place of mind

THE UNIVERSITY OF BRITISH COLUMBIA

Message from the Department Head

As we celebrate the successes of the past 100 years at UBC, we look forward to an exciting future in which we pay increasing attention to a balanced, modern and industry relevant curriculum with a suite of enriching activities for our students. Therefore, I am pleased to share with you the Spring 2016 issue of The Exchanger, our department's newsletter, which provides highlights from 2015. Our hope with this annual publication is to give you a glimpse of stories about our faculty, staff, students and alumni from our thriving Department of Chemical and Biological Engineering.

Last year we once again received tremendous recognition for our department. It is noteworthy that our faculty members won two consecutive R.S. Jane awards, one in 2014 (Dr. David Wilkinson) and one in 2015 (Dr. Jamie Piret). It is rare that the winners of the Canadian Society for Chemical Engineering's highest award are from the same department in two consecutive years. We welcomed Dr. Anthony Wachs as assistant professor in our department -- jointly appointed with Mathematics – and Dr. Gabriel Potvin as Instructor. We look forward to their contributions to our teaching and research programs.

Staff also received accolades: we would like to congratulate Doug Yuen, Workshop Supervisor, for winning the Dean's Award for Excellence in Service. We welcomed a CHBE alumna Juana Gonzales and Mr. Salman Zafar to our staff, and said goodbye to Alex Thng, our electronic technician, who retired last year after 25 years of dedicated service to our department. We wish Alex a happy retirement!

In student news, this year we started the Coordinated International Experience Program, an initiative in the Faculty of Applied Science offering third-year UBC Engineering students a chance to study abroad. Third-year students from the department with good academic standing who are interested in studying in Denmark, Netherlands and Switzerland now have the opportunity to do so. Courses taken abroad are pre-approved for UBC Engineering degree credit requirements.

During the May and November 2015 convocations, 62 students received their BASc degree in Chemical Engineering and 33 in Chemical and Biological Engineering. In addition, seven students received a MASc degree, one student a MSc degree and six a MEng degree. Seven students also received their PhD degree. Following the May convocation, we always look forward to the opportunity to meet with the families of our students at a reception in our building. We warmly congratulate all these students. As the economy and particularly the energy sector face some well-known challenges, we hope that employers will take a long term view and continue hiring these outstanding graduates.

It has now become a tradition to host a 50-year reunion of our alumni. The Chemical Engineering class of 1965 visited the Department on May 18, 2015. I am always delighted to welcome our graduates, update them on the department's news and achievements, and give a tour of our facilities. I am grateful to our emeriti professors Norman Epstein and Richard Branion for joining the reunion.

This past year was also filled with great sadness. Helsa Leong, our graduate secretary for almost 30 years, passed away on December 1, 2015 after a long fight with cancer, which she did with amazing grace, optimism and courage. Helsa was an inspiring person, a trusted colleague and friend for so many years. She was a pillar of our graduate programs and her dedication to the department was exemplary. Her kindness, generosity and beautiful smile touched many lives – especially those of graduate students from all over the world. As one of my colleagues said, the department is a gentler place because of people like Helsa and there is a great void in our hearts and in the department.

We hope that you will enjoy reading the 2016 issue of The Exchanger. We always look forward to hearing from you and would be delighted to welcome alumni and friends to the department.

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

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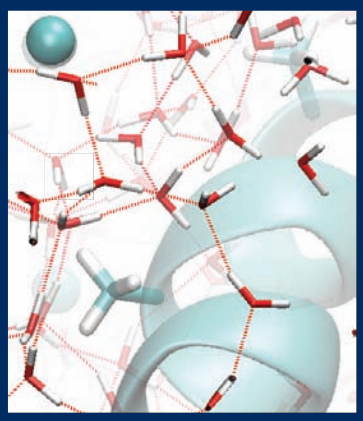


On the cover

The cover design was based on a recent study done by Bagherzadeh and co-workers in which they applied molecular dynamics technique to propose a mechanism for the inhibitory action of antifreeze proteins (AFP) in hydrate growth prevention.

Graphic by Alireza Bagherzadeh.

Mimicking Nature : Surface Wettability

By Dr. Savvas Hatzikiriakos

Inspired by nature, great attention has been devoted to the design and development of artificial surfaces with extreme water repellency properties so called as superhydrophobic. The most famous natural superhydrophobic surface is the surface of the lotus leaf. The extreme water-repellent properties of the lotus leaf results from the dual micro/nano roughness with micro pillars in the size between 5 to 10μm covered

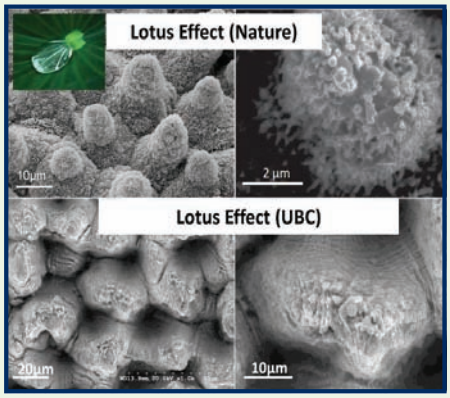


Figure 1. Lotus Effect - Nature and UBC

with nano grains waxes with the size of approximately 150nm (Figure 1.). The dual scale structure of the lotus leaf minimizes the contact between the water droplet and the surface, rising the contact angle (CA) to more than 150° and lowering the contact angle hysteresis (CAH) to less than 5°.

As a result, the droplet easily rolls off the leaf carrying off contaminations (self-cleaning property). Nature has also developed anisotropic superhydrophobic surfaces in which the droplets can roll off following a preferential direction dictated by the direction of the structural features.

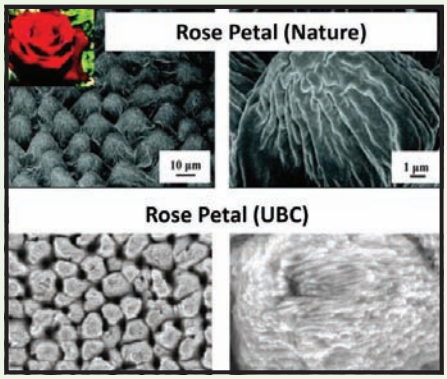


Figure 2. Rose Petal - Nature and UBC

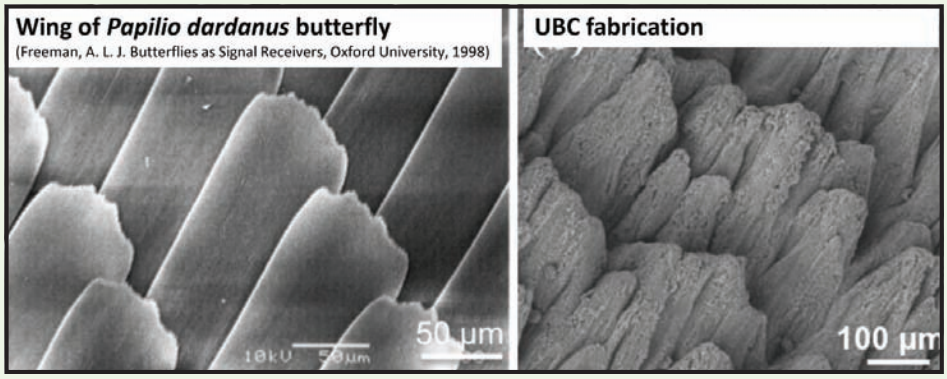


Figure 3. Wing of Papilio dardanus butterfly and UBC fabrication

Remarkable examples of self-cleaning superhydrophobic surface with anisotropic properties are rice leaves. An opposite act is shown by the rose petals, which are also superhydrophobic, although with very high adhesion properties. The rose petals have the ability to retain water droplets without letting them roll off when the surface is inclined or even tilted down (Figure 2.). By comparing the size of the micro pillars in lotus leaves and rose petals, rose petals have more distances between the micro pillars. This makes the droplet fully or partially penetrating into the microgrooves; this collapsing results in a strong adhesion between the droplet and the surface. The skin of some sea creatures also exhibit extreme water and oil repellency. The filefish has sandpapery, bony skin instead of common flaky scales seen on other fish. In oil-spilled sea areas, filefish is observed to be free from oil contamination. Additionally, it was found that oil droplets tend to roll off along a head-to-tail (HT) direction. This anisotropic oil repellence (superoleophobic) may endow the filefish with directional easy-cleaning in oil spilled seawater, meanwhile avoiding accumulation of oil at its head.

The Hatzikiriakos group has worked extensively in this area of mimicking nature by developing techniques to fabricate superhydrophobic and superoleophobic surfaces. Examples of such surfaces appear in Figures 1, 2, and 3, where the lotus leaf, the rose petal leaf, and the butterfly wing surfaces have been fabricated on metallic and polymeric amongst others. Not only the appearance is the same, but also, the wetting behaviours of the fabricated surfaces are nearly identical to the surfaces found in nature. The techniques used include laser ablation, hot embossing and various electrochemical deposition techniques.

Another aspect of Professor Hatzikiriakos' program is the use of these unique surfaces in engineering applications. One application is the fabrication of implants such as stents, vascular grafts, and heart valves that can minimize platelet adhesion and protein adsorption. When blood contacts the surface of an artificial vascular prosthetic, the plasma proteins adsorb to the surface of the biomaterial. The protein coating can serve as a substrate for cell and platelet adhesion. The adsorbed layer is capable of initiating thrombogenic and immunologic responses including inflammation and platelet adhesion and activation respectively. Therefore, for blood contacting implants, the protein response can ultimately lead to the implant failure, while in some biomaterial applications, protein adsorption can be a desired result. The interactions between the surface of the implant and plasma proteins directly dictate the biocompatibility or failure of the implant. The ability of a blood contacting biomaterial surface to minimize protein adsorption is believed to be part of the implant biocompatibility.

Other applications where the fabricated surfaces are tested, include superhydrophobic surfaces in low friction applications (ski and skate bases), anti-fogging, anti-icing, anti-fouling and anti-corrosive applications as well as in filtration.

Micro, Meso, Macro... Cleaner, Greener, Better!

By Dr. Anthony Wachs

We all dream of a world of infinite source of energy in which technology facilitates our life beyond imagination, and by-products and wastes of consuming that energy are biocompatible and easily recyclable materials. Unfortunately, this is rather unlikely to happen, at least as a short-term vision. Our society and our lifestyle are strongly tied up to the amount of energy available to us, but over the past 40 years we moved from a world of presumed infinite source of energy to a world of scarcity, combined to the right now known issues of dealing with the garbage. The nimby (Not in My Back Yard) attitude is not an option anymore, as the problem is global. Many of us probably remember, with a sense of amusement, the final scene of this now cult movie from the 80s, "Back to the Future", in which the charismatic and hyper-creative research pioneer Doc Brown poured a banana skin, a few food scraps and who knows what else into the engine of his revolutionary car as fuel to propel it. This is a fancy illustration of process intensification: use as much energy as possible from what is available to us as potential energy source. Of course, the movie does not address what are the wastes (greenhouse gases) of this special fuel combustion (it does not even tell whether Doc Brown's futuristic car is propelled by a combustion engine), but the idea of recycling our by-products and garbage as a new energy source is already there, and we call this nowadays "waste gasification/combustion". So the 21st revolution of energy supply is already on its way, and Doc Brown was right, as he usually is! (Except for travelling backwards in time, but this is a minor detail, isn't it?).

> "... over the past 40 years we moved from a world of presumed infinite source of energy to a world of scarcity..."

In general, the problem of energy supply to everyone on a 7 billion human being planet is a very complicated one, as it involves technological, societal, economic and political issues. But as researchers and engineers, there is a lot we can do. Basically, there are two complementary routes to follow. The former implies to improve the energy efficiency of existing processes as, e.g., getting the same mechanical power from a combustion engine with a lower amount of petrol or rendering hydraulic fracturing cleaner by diminishing the amount of additives used in the fracturing fluid. The latter consists in developing and designing new, greener and more sustainable processes that utilize renewable materials and sources like wood, sun and wastes. Easy to say, tough to do, but not impossible. As an individual, I like to see myself as someone aware of the problem of energy supply and environmental footprint because, among other habits, I commute to my office at UBC everyday by walking or biking. But when I fly anywhere, my environmental footprint becomes so bad that I would probably have to walk to my office over the next 10,000 years to compensate. Can I fly less? Sure, that's what I always try to do. Can I quit flying? Probably not, given my position as a researcher since meeting with my fellow researchers from abroad is essential. And anyway, discovering the rest of world has always been part of human aspirations, and constitutes a strong vector for open-mindedness and tolerance. So, back to more technological preoccupations, as I am not necessarily ready to quit flying, what I can try hard to do is contribute to designing aircraft turbines that are less fuel-intensive and refining processes that produce that fuel for a lower energy cost.

Many man-made processes, as well as many geophysical or environmental phenomena, involve a multiphase flow. Particle-laden flows are a particular class of multiphase flows in which dispersed solid particles exchange momentum, heat and mass with the surrounding fluid, that can be either a gas or a liquid. Due to the flow complexity, making significant advances in the comprehension of particulate flows constitute a great challenge for research scientists and engineers. We intend to address this challenge computationally, on multiple scales and primarily in order to improve the design and control of energy conversion industrial processes. A large number of these industrial processes involve reactive particle-laden flows: catalytic fluidized bed, combustion in a rotating drum, wood gasification, and solid waste combustion . In a worldwide context of increasing energy cost and the urge for an accelerated transition to greener and renewable energy, mastering and controlling the complex particle-laden flows ubiquitous in these processes is of major importance to lower their energy consumption and environmental footprint. One key factor is to better understand all the intricate couplings at play in these flows: hydrodynamic, chemical and thermal. Capitalizing the acquired improved comprehension in Computational Fluid Dynamics (CFD) codes would lead to a smarter design resulting from reliable flow predictions. Available CFD codes cannot yet ensure a sufficiently reliable prediction, and often lack the capacity to exploit the unique opportunities offered by massively parallel supercomputers to apply advanced models to full-scale industrial problems. Our goal is to advance on

> "...The problem of energy supply... is complicated....as researchers and engineers, there is a lot we can do"

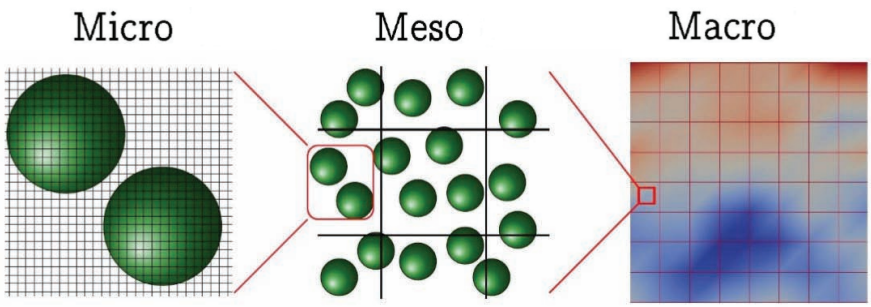


Figure 4. Micro, meso, and macro scales

two complementary scientific paths: (i) to enhance the predictions of existing physical models of particle-laden flows and (ii) to develop massively parallel simulation tools and exploit the increasing computing power offered by modern supercomputers. These are the two key components of our research program on multi-scale modelling of reactive particulate flows.

> "Solid particle solar receivers ... to produce hydrogen without oil or nuclear power as an energy source."

Primary applications of our work are processes that supply energy from biomass and/or wastes, facilitate CO_2 capture, convert solar energy to heat, and store heat. The three technologies we have in mind are:

1. Wood, biomass or wastes gasification. The produced synthetic gas can then either be burnt in gas turbines or transformed into synthetic fuel by the Fisher-Tropsch method (Biomass to Liquid). It is a promising technology in the context of a carbon neutral or low carbon economy.

2. Chemical looping combustion (CLC) where combustion takes place in a first fluidized bed interconnected to a second fluidized bed that regenerates (re-oxidizes) the solid particles. The primary asset of CLC is the ability to isolate CO_2 and hence optimize its capture.

3. Solid particle solar receivers, that can be integrated in a sophisticated energy conversion cycle, e.g., with a fluidized bed heat exchanger as in solar thermal plants or in a watersplitting thermo-chemical cycle to produce hydrogen without oil or nuclear power as an energy source.

Other applications include rigid fibre suspension flows in the pulp & paper industry, hydraulic fracturing in the oil & gas industry, mining tailings slurries and drilling cuttings removal, etc., all in the natural resource based Canadian industry, as well as targeted drug delivery in the human body, sediment transport in rivers in environmental engineering, etc. There is a strong demand for more advanced modelling tools in many different application fields.

From 2001 to 2015, Dr. Wachs worked as a research engineer and scientific advisor in Fluid Mechanics, Multiphase Flow and High Performance Computing at IFP Energies nouvelles, a public-sector national lab in the field of energy in France. Over the past ten years, he led a research group on the multi scale modelling of particle-laden flows (peligriff.com) and his intention is now to transfer his expertise to and recreate a similar research group at UBC. The multi-scale analysis framework he has been developing is based on a 3-scale decomposition: (i) micro, the scale of an individual particle, (ii) meso, the scale of a large group of particles, and (iii) macro, the scale of the process (Figure 4). The micro-scale model contains a very limited number of parameters.

The corresponding numerical simulations are deemed to be high fidelity but also computationally extremely demanding such that only small model systems can be examined. Conversely, macro scale models are designed for numerical simulations of real-size industrial systems but contain a large number of fitting parameters. Meso scale models represent an intermediate level of description. We develop a bottom-up strategy. What we learn from the detailed high-fidelity simulations at the micro scale cascades upwards to improve the meso scale description, and similarly from the meso scale to the macro scale. This multi-scale analysis based on a decomposition of scales represents a rewarding research path to follow. It is not a new idea, but is only recently becoming computationally feasible thanks to the increasing computing power offered by large supercomputers. The potential for this is going to grow.

> "...the increasing computing power offered by large supercomputers... is going to grow."

The numerical tools developed by Dr. Wachs' research group have led to numerous collaborations over his time in France as well as at UBC. In the field of dense suspension and granular flows, Dr. Wachs has been collaborating for years with Prof. Frigaard and Prof. Balmforth, both with the UBC Department of Mathematics. In CHBE, he is excited to contribute to the on-going work of the Fluidization Research Centre (inertial particle-laden flows with heat and mass transfer) as well as of the Pulp & Paper Centre (dense suspension flows). His research on the dynamics of reactive particle-laden flows spans a broad range of fields including Fluid Mechanics, Chemical Engineering, Applied Mathematics, High Performance Computing, Software Engineering, Heat Transfer and Granular Mechanics. UBC offers an invigorating research environment with a high potential for team-work with other strong researchers. Dr. Wachs is looking forward to interact with his UBC fellow researchers and apply the numerical tools developed in his group to new problems.

The Future of Chemical and Biological Engineering

THE FORCE AWAKENS...

By Anne Marie Corrigan

Engineers dub themselves with the sobriquet "Rulers of the World". They take the power that comes with this responsibility to heart and are determined to make our world a cleaner, safer place.

There are two overarching modern-day challenges that face chemical and biological engineers. One is demographics and the impact of a bulging population on the world's resources. The other is finding methods to assist Generation Z students, who have grown up with technology, to anticipate and solve problems of the future.

Today's Dark Side issues include an over-dependence on fossil fuels, lack of clean drinking water, climate change, environmental and sustainability challenges and health considerations associated with an increasingly elderly population. From UBC's Chemical and Biological Engineering (CHBE) faculty members, to students, to industry powerhouses, those already involved and those entering the field are doing so with the purpose and intent to mak

Eyes to the Horizon - The Challenge of Demographics

"We have an obligation to help shape the future not just be shaped by it," says Dr. Axel Meisen, Professor Emeritus Chemical Engineering and former Dean of Applied Science at the University of British Columbia.

> "We have an obligation to help shape the future, not just to be shaped by it,"

"The chemical engineers of tomorrow must try and anticipate what the future will hold. When we recognize the driving forces that shape the future, students and faculty can prepare themselves. But it has to be interactive. We are all responsible," he says.

Dr. Meisen believes that the most obvious and perhaps biggest driving force is demographics. The population of the world is aging very rapidly and the elderly have more medical, pharmaceutical and assistive device needs than those who are younger. Dr. Meisen indicates that Chemical engineers will need to think about the impact of the aging population.

Chemical Engineers will need to consider all aspects of bio-medicine and develop not only new ways of producing medicines, but also contribute to the development of artificial body parts including tissues, organs, liver, kidney, and even eyes. "This is an important area of research and development; it needs to be done ethically and in accordance with the highest levels of moral principles," he encourages.

In a world with a population of well over 7 billion people (and the worldometer keeps ticking), one wonders how the planet can sustain us all. Although there is a tremendous strain on our natural resources, there is a large, highly motivated body of scientists and engineers who are applying their brain power to help lighten the load.

Water, Water - Everywhere?

As a future "steward of the environment", graduate teaching assistant at the CHBE Department of UBC and Masters of Applied Science student, Sean McBeath, is focusing considerable attention on the problem of water - the blue gold of the future and our planet's lifeblood. He is aware that this precious commodity must be treasured and treated with respect.

Every human's right to the highest attainable standard of health, including access to safe water and adequate sanitation, was enshrined in the World Health Organization's constitution over 50 years ago. Yet one of the most fundamental conditions of human development is elusive for many, free access to clean water. The lives of many people, who are often among the poorest on our planet, are often devastated by this deprivation. This concerns McBeath who was raised in

Most water advisories occur in remote First Nations lands.

Maple Ridge, BC where he grew up drinking well water. Sensitive to the taste and how chemicals can change the quality and safety of water, he has been interested in engineering clean water since a grade 2 school project.

He is particularly concerned about small, remote communities that suffer from inadequate drinking water supplies in Canada. In BC alone last year, McBeath notes that there were over 500 boil water advisories, many in First Nations communities, some of which have had advisories for decades. Remote communities typically have little or no technical support. Water treatment equipment maintenance is challenging and supply of chemicals is costly due to lack of accessibility.

To solve the problem, McBeath is researching an electrochemical process for purifying drinking water known as electrocoagulation (EC). The research aims to develop a fundamental understanding of EC through systematic experiments involving a flow through set-up, improving the process efficacy and scalability for potential integration into small water systems.

As for the future? McBeath not only understands the engineering code of ethics that obligates engineers to "not do harm". He recognizes that engineers should provide positive impacts, "Our skills and education have the potential to make a tremendous difference," he says.

Capturing Carbon Dioxide and Finding Alternate Forms of Energy

How we avail of the earth's energy resources will depend greatly on the success of research that is being conducted by chemical and biological engineers. One of the most talked-about and debated areas of change, is taking place in the energy resource industry. Significant funding and research resources are directed to develop solutions for a low carbon world. Despite challenges to Earth's wellbeing, the planet, so far, has remained remarkably resilient. Of the approximately 37 million metric tonnes of carbon dioxide dumped into the atmosphere each year by humans, about half are soaked up by oceans, forests and grasslands. But how much longer will our natural carbon sinks hold out? Something has to be done and, thankfully, it is.

A key player focusing on eliminating industrial carbon emissions is the Carbon Capture and Conversion Institute (CCCI). The institute is a collaborative partnership between CMC (formally Carbon Management Canada) Research Institutes, BC Research Inc., and the University of British Columbia. Professor Naoko Ellis, whose areas of expertise include fluidization and multiphase systems, carbon dioxide mitigation and capture, bio-fuels and data analysis is greatly encouraged by the enthusiasm and commitment behind the organization of the Institute. As a child, Dr. Ellis was passionate about the environment, and especially with garbage. After reading Rachel Carson's Silent Spring when she was 13 years old, she recognized the urgency to act quickly.

The establishment of the Carbon Capture and Conversion Institute in BC comes at a critical time. It will become an internationally known process developer, contributing to addressing the challenge of enabling industry to thrive in a low carbon world. Three parties have come together in perfect alignment to close the gap between new ideas and commercialization in the areas of carbon capture and conversion. We focus on rapid and cost effective reduction of uncertainties associated in managing industrial carbon emissions.

Professor David Wilkinson welcomes the challenge of finding alternate sources of energy and believes that these issues are some of the most important in this century. "We are working to convert carbon dioxide into useful materials, cleaning up water and of course finding new sources of energy. Solar energy for example is an exciting area of research that we are conducting in chemical engineering. Although fossil fuels will be around for some time, work is being done to reduce its harmfulness as we continue to use it while we transition into a renewable energy space."

However, Dr. Wilkinson insists that policies, communication and public license surrounding this area are vital and argues that it is important to increase integration of the humanities and social sciences into engineering. "As chemical engineering develops there will be increased interaction with other disciplines," he says.

Sean McBeath inspecting an electrocoagulation test unit

What will the future engineer look like?

What will the future engineer look like?

Dr. Wilkinson indicates that most importantly, future engineers need to think more laterally. Chemical Engineering will be playing an even bigger role in sustainability, environmental issues, health and food which are vital for the health of our planet.

"I keep thinking of The Riders of the Apocalypse and consider, how we, as chemical engineers, can ward off an 'end-of-the world' scenario," he jokes. We can generate whole new generations of solutions. It is within our grasp and ability. We will not be as restricted as we were in the past as the ability to work across the science and engineering disciplines bring lots of different ideas and solutions to problems.

The App Generation and Digital Detoxing

After 12 years of teaching at CHBE, Dr. Ellis sees a shift in the mind sets of incoming students. "They have a clearer purpose and intent when they enter into the Department," she says.

Dr. Ellis finds it tremendously encouraging, that students of today feel a moral obligation in their responsibility towards the planet. Their desire to affect positive change reflects the department's sensitivity to sustainability and the environment.

Students entering the field of chemical and biological engineering can have good intent and purpose in the world but require critical thinking skills to be successful.

The internet information highway is a wonderful tool for obtaining answers quickly and with little research, all one needs is the click of a button. Ease of downloading data is helpful in a results-oriented society. However, there is also a concern that it may slow-down the development of some students' skills. The potential reduction in critical thinking ability worries Dr. Wilkinson.

He observes that the pace has sped up and access to information has changed the nature of how we think about problems and how we solve them. There is danger in relying on social media, blogs and other forms of non-peer reviewed or non-evidence based sources for information.

Dr. Wilkinson also believes that we can't succeed without failure - a gamble that many students today are reluctant to risk and worries that there is too much pressure on students to get where they are going faster with success.

We don't always have to have growth or change," he insists. The classical methods of learning and solving problems are still relevant. There is a danger of where 'progress' can take you or where you take it. We need to be careful and as educators, need to expose the students to real-world problems. We cannot undermine the necessity of fundamentals to be able to critically analyze problems.

Universities today see the importance of providing inter-disciplinary studies. Chemical Engineers need to work across boundaries with other professions. At CHBE, a research project of Dr. Wilkinson demonstrates the effectiveness of multidisciplinary collaboration as a team of engineers and scientists develops a process to clean up water, remove carbon dioxide, and produce useful by-products.

"It's exciting when, by working together, we can achieve several results through a single process," he says.

Try Again. Fail Again. Fail Better.

Claudio Arato has a unique outlook on the future of chemical engineering careers and opportunities from a business perspective. He is VP Engineering and IP lead of Ronin8, a start-up company dedicated to e-waste recycling by recovering and re-using 100 per cent of the materials contained in electronics.

Arato also promotes inter-disciplinary approaches noting that there must be a more complex melding of chemistry and biology in education. He comments that he can't do his job without communicating with all the other disciplines. "I've worked in biofuels, nano-technology and water treatment and have needed to be educated in electrical, physical and civil aspects of engineering from an industrial manufacturing point of view."

> "Engineers can't be innovative if they are not creative and curious."

He insists that there should not only be an emphasis on inter-disciplinary studies but there should also be a focus on earlier student involvement in the design stage. He believes that, hands-on, practical experience not only brings arcane concepts to life at an earlier stage in student education, but also assists students thrive in the real-world.

But perhaps more importantly, and echoing Dr. Wilkinson's comments, Arato is insistent that students need to be given the space and encouragement to explore, challenge themselves and take risks during their educational development - even if it means failing. In fact, he believes that failing is a vital part of education and progress. Freshly-sprung graduates should attempt start-ups to begin developing their own unique perspective on morality, individuality and creativity in innovation.

"When you fail there are consequences, of course," he says "but you should explore, expose yourself to potential failure. The best way to do this is to attempt putting your ideas into practice through a start-up and forward-thinking businesses, thus opening up the door for innovation."

Arato feels that we would be doing our young people a disservice by not encouraging the creative impulse that makes us human. New graduates should do the hardest, riskiest things that drive their passions first. They should embrace learning culture and realize the cultural impact of what they do. Engineers can't be innovative if they are not creative and curious.

To Arato, Chemical and Biological Engineering is change. The world is increasingly reliant on computers and automation, but computers can't laugh or cry or come up with non sequitur ideas on their own. There is a need to foster the human spark to stay ahead of the game. Arato observes "UBC's CHBE program is elite because as educators, they are very much aware of this."

The Future Belongs to the Curious - Helping Students to Become Lifelong Learners

Even though Einstein said that imagination is more important than knowledge, UBC's CHBE faculty imparts both in its curriculum.

Associate Professor and Associate Head of Undergraduate Programs and Accreditation, Dr. Bhushan Gopaluni, is one of the driving forces behind ensuring that students' education encompasses more than the obvious.

In 1989, representatives of the engineering profession and engineering accreditation organizations from participating countries around the world signed the Washington Accord (WA) to ensure substantial equivalence of university programs. The WA specifies 12 attributes that a student must develop including the ability to perform engineering design and to have a fundamental knowledge base.

Nowadays, not only is there a requirement to focus on the educational environment for students, but students must be routinely assessed on the 12 attributes to determine how well they are developing. This creates a feedback loop which can be used to generate continuous program improvements and assists CHBE in identifying appropriate curriculum changes to assist students become exceptional engineers.

Dr. Gopaluni, whose primary research interests are in Process Modeling and Control, characterizes this as a typical feedback process control loop. It's like seeing your reflection in a mirror or better yet again, driving with a rear-view mirror. Drivers do not just plough straight ahead but take into account what is around them and adjust their driving accordingly. You could compare it to temperature control in a room when the room gets too warm, the controller reduces the heat input. It's a simple as that.

The Pursuit of Knowledge

Dr. Gopaluni notes that the way students learn today is different and his observations echo Dr. Wilkinson, Students find the answers on the internet whereas they used to read the text book cover to cover and pick up other morsels of information along the way, assisting their critical thinking development.

CHBE provides the Capstone Design Project to pique students' curiosity and to develop critical thinking capabilities. Students must use the knowledge and skills acquired during the previous three years of university education to solve an open-ended problem.

CHBE also provides education through the Co-op Program, making courses more experiential. "We must make it more attractive for students to enter the university. It is possible to do on-line courses at home, so they need to find value in attending classes. "Three quarters of students register in Co-op Programs and obtain work experience, so that it is integrated into their education," says Dr. Gopaluni.

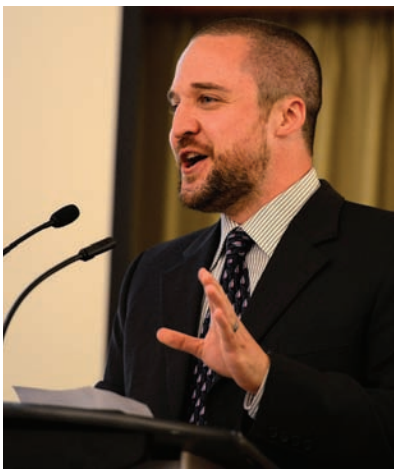
The Audacity of Hope - Working Towards a Better Future

We bear witness to a world that is in the midst of rapid changes. As evidence mounts about earth's maladies - rising temperatures, the oceans' acidification, deforestation and extreme weather, there is an anxiety amongst the general population that things are shifting so quickly we don't have the expertise to fix it all. However, we can rest assured. The spirit of UBC's CHBE is resolute. It is not only resolute but also has a faculty and student body fully equipped, gifted and motivated to make a real change. The CHBE faculty and students are fully engaged to developing solutions.

Our future lies in the hands of professors who have received accolades and prestigious awards such as Officer of the Order of Canada, the Gunnar Nicholson Gold Medal, APEGBC Meritorious Achievement Award, Fellow of the Royal Society of Canada, Fellow of the American Physical Society, R.S. Jane Award and the Grove Medal, and multiple Killam Teaching awards to name but a few. Up-and-coming students are also making their mark in Chemical and Biological Engineering. International student awards and recognition include placement in the Young Investigator Award competition World Congress on Bioengineering, a Youth in Motion's Top 20 nomination and a Young Scientist Award at the 15th International Congress on Catalysis. The list is long and impressive and a source of pride and hope that the department and its graduates are ready and doing their part in finding the solutions to the world's problems.

With such a body of talent we can heave a collective sigh of relief. The toll of humans on the planet may be unprecedented but through education, technology and ingenuity our engineers are developing solutions to today's global challenges and contribute to a bright future for humankind and our planet.

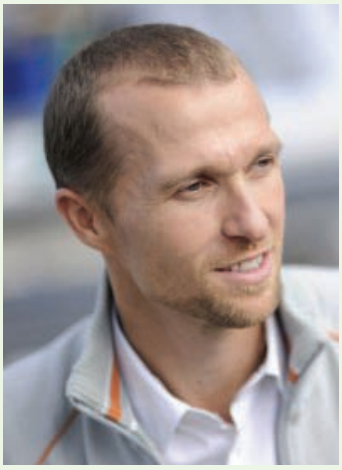
Dr. Gabriel Potvin



Dr. Gabriel Potvin is very pleased to join the Department of Chemical and Biological Engineering and the Applied Science stream of Vantage College as an instructor. Dr. Potvin obtained a B.A.Sc. in Chemical Engineering and a B.Sc. in Biochemistry at the University of Ottawa before obtaining his PhD at the same institution, specializing in bioprocessing and industrial microbiology. He has led research projects in many aspects of bioprocessing, from the development of novel recombinant microalgal and yeast strains for the production of industrially- and medically-relevant products, to the design, optimization and operation of bioreactors for their mass production.

Although always interested in research, Dr. Potvin's passion has always been teaching and STEM education. In addition to more conventional teaching activities, he has been heavily involved in science and engineering educational outreach in both management and volunteer roles, with programs such as Let's Talk Science, a national outreach organization, and Ottawa-based Science Travels, which operates in remote First Nations and Inuit communities to promote science literacy and post-secondary education. Dr. Potvin has been recognized with multiple awards, including at the national level, for the excellence of his contributions to science and engineering promotion, for the success of his leadership and management of these organizations, and for the novelty and measurable impact of new initiatives he has created on student engagement in STEM fields. It is the opportunity to pursue a career in higher-level engineering education that has drawn Dr. Potvin to the academic teaching stream at UBC, and he looks forward to sharing his passion with the students here.

Dr. Anthony Wachs



Dr. Anthony Wachs is very pleased to join the Department of Chemical and Biological Engineering of UBC as an assistant professor, a joint position with the Department of Mathematics. His research interests lie at the frontier between Fluid Mechanics, Heat and Mass Transfer, Numerical Modelling and Applied Mathematics. His research has application in the chemical engineering and natural resource industry, ranging from catalyst reactors and biomass converters to multiphase flows in pipelines. He is pleased to have opportunities to interact with CHBE researchers and to bring his own expertise, high performance parallel computing and numerical simulation of multiphase flows, to the existing strengths in CHBE in experimental characterization and modelling of these flows. His specific interest in particle-laden flows will effectively complement the work carried out by the UBC Fluidization Research Centre.

Dr. Wachs received his Bachelor of Engineering from the University Louis Pasteur of Strasbourg, France, and Master of Fluid Mechanics from the Institut National Polytechnique of Grenoble (INPG), France. He completed his PhD at INPG (2000) in Computational Rheology. Dr. Wachs was employed by IFP Energies Nouvelles (IFPEN), a French national energy lab, as a research engineer in Fluid Mechanics for 9 years at Rueil-Malmaison. He was involved in a variety of research projects in rheology, multiphase flows and numerical modelling, some in partnership with Oil & Gas majors, BP, Total, Petrobras and Chevron.

In 2009 Dr. Wachs spent a year secondment in Cadarache, the major Nuclear Research center in Europe, where his expertise in multiphase flows contributed to enhancing the safety of nuclear reactors. On return to IFPEN, he gained his HDR (French accreditation to supervise research) and became the youngest member ever of the prestigious IFPEN College of Scientific Advisors. From 2010 to 2015, Dr. Wachs was based at IFPEN Solaize. Close interaction with industrial players in the chemical and process engineering domain enabled him to learn about chemical reactors and fluidized beds and opened opportunities for application of his research work to real-life industrial problems.

During his 15 years at IFPEN, Dr. Wachs supervised Masters, PhD and post-doc students, collaborated with academic research groups globally and occasionally taught in French universities. He is enthusiastic about interacting with the students at UBC. In Lyon, he led a research group on numerical modelling of particle-laden flows (www.peligriff.com). Continuing this research activity at UBC, he envisions creating a similar research group and connecting to Canadian industry. Global knowledge he acquired of the energy sector leads him to support the societal view that a major concern is reduction of our environmental footprint. Together with securing energy supply and progressively moving to a less energy-intensive life style, one component of this 21st century challenge is to improve the energy efficiency of existing processes through intensification. In parallel, is a need to multiply efforts to design greener and more sustainable processes using renewable materials and sources, like wood and sun. The mastering and control of multiphase flows, ubiquitous in these processes, through numerical modelling is rewarding research for Dr. Wachs.

Dr. Axel Meisen

We are pleased to welcome Dr. Axel Meisen Emeritus Professor. Dr. Meisen, P.Eng, holds a PhD in Chemical Engineering from McGill University in Montreal (1970) and an MASc from the California Institute of Technology (1966). He obtained his B.Sc. degree at the Imperial College of Science and Technology in London, England (1965).

Dr. Meisen joined UBC Chemical Engineering as associate professor in 1969 then served as Associate Dean and Dean of Applied Science from 1977 to 1997. Dr. Meisen subsequently moved to the east coast of Canada to serve as president and vice-chancellor of Memorial University of Newfoundland from 1999 to 2007.

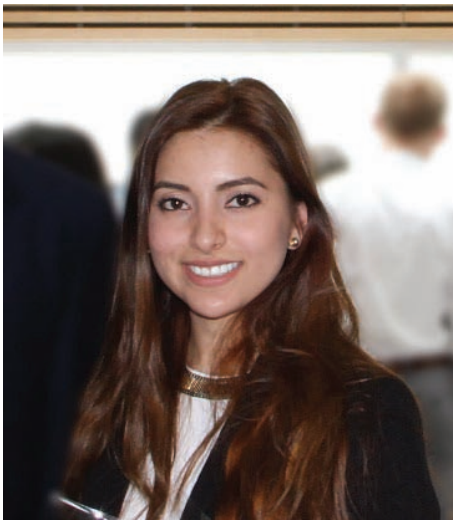
Dr. Meisen's areas of expertise include leadership of academic and professional organizations operating in national and international settings; development of major collaborative research and educational initiatives with private- and public sector organizations; fund-raising; and technology related to the petroleum and chemical industries. A fellow of the Canadian Academy of Engineering, Dr. Meisen is a Professional Engineer (P.Eng) and European engineer (EurIng). He is a member of the Order of Canada. He has been awarded the Medal of Distinction by the Government of Peru and was elected to the Peruvian Academy of Engineering. He is a fellow of the Canadian Academy of Engineering, the Institution of Engineers of Ireland, and the Canadian Institute of Chemistry. He has received awards for research papers from the Canadian Journal of Chemical Engineering, the ERCO Award for outstanding contributions to the field of chemical engineering, and the Professional Service Award from the Association of Professional Engineers of British Columbia.

Salman Zafar

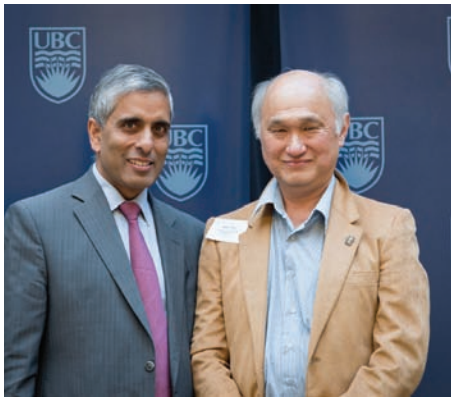
Salman Zafar is the Graduate Administrative Assistant at the Department of Chemical and Biological Engineering. He is also involved in the Masters of Engineering Leadership Program as the Program Assistant for the Green-Bio Products pillar. Before coming to CHBE, Salman was a part of UBC Staff Finders since January 2015. Salman is an avid blogger, holds a MBA from Pakistan, and also has Financial Services experience.

Juana Gonzales

Juana Gonzales is a Chemical Engineering alumna of the University of British Columbia. She is working towards her Professional Engineer (P.Eng) designation in the province of BC. Juana is developing her engineering career in the Department of Chemical and Biological Engineering at UBC as student support. Her major task is the successful renewal of accreditation of the UBC Chemical and Biological Engineering programs by the Canadian Engineering Accreditation Board. Additionally, Juana has designed and optimized chemical engineering laboratory experiments for undergraduate students in the department. The core areas of focus in these experiments are water treatment, thermodynamics and fluid dynamics. Juana is eager to build and contribute to the educational environment at UBC.



Alex Thng



Dr. Arvind Gupta (left) and Alex Thng (right) at the 2015 UBC 25 Year Club Celebration

Alex Thng joined the UBC Chemical Engineering Department in 1990 as Engineering Technician. As a member of the Workshop, he worked on the electrical and instrumentation aspects of undergraduate, graduate and research experimental apparatus and equipment. To assist faculty and students, Alex learned programming and became adept at designing the control systems as experimental equipment complexity increased.

In the spring of 2015, Alex became a member of the UBC 25-year club. After achieving the 25-year milestone, Alex retired. Not one to be still, Alex is active playing tennis and travelling. We wish Alex many wonderful and exciting travels!

CHBE IAC

Since the Department's Industry Advisory Council (IAC) was convened in mid-2012, Council members have provided a sounding board for Department ideas and initiatives. The IAC has assisted the Department in:

- Co-op and Undergraduate Student Professional Development
- Graduate Student Professional Development
- Development and Fundraising
- Research - University/Industry Collaboration

The IAC is a dynamic and valued source of inspiration, ideas, feedback and advice for the Department.

Our current IAC members are:

- Claudio Arato, P.Eng. - Chief Technology Officer, Provectus Engineered Materials
- Terry Chmelyk – Advanced Control Solutions Manager, Spartan Controls
- David Gandossi - Executive Vice President, CFO & Secretary, Mercer International Inc.
- Alfred Guenkel, P.Eng. - Partner & Principal Chemical Engineer, Noram Engineering & Constructors Ltd.
- Paul Henderson, P.Eng. - Manager, Solid Waste, MetroVancouver
- Eric Jervis - Principal Scientist, Stem Cell Technologies
- Simon Malin - Regional Managing Director, Western North America, Hatch
- George Peat - Executive Director, GERMMAX
- Martin Pudlas, P.Eng. - Vice President Operations, Canfor Pulp and Paper
- Tim Watson, P.Eng. - Senior Vice President, Project Development, Teck Resources Limited
- Peter Wynne, P.Eng. - Technical Specialist, Chevron Canada Limited

At the end of 2015, we thanked Paul Watson for his contributions to the IAC, and wish him the best in his relocation to New Zealand. We look forward to working with Martin Pudlas and Terry Chmelyk who have joined the IAC.

TOP FROM LEFT - David Wilkinson, Richard Sones, Peter Englezos, Tim Watson, Peter Wynne, Martin Pudlas, Ezra Kwok, Naoko Ellis, Juana Gonzales, Michael Schoen

BOTTOM FROM LEFT – Val Martin, Marlene Chow, Vikram Yadav, Savvas Hatzikiriakos, Simon Malin, George Peat, Claudio Arato, Heather Trajano

James Piret **2015 R.S. Jane Award**

Congratulations to Dr. James Piret, recipient of the 2015 R.S. Jane Memorial Award, the premier award from the Canadian Society for Chemical Engineering. Dr. Piret is being recognized for his outstanding accomplishments in the field of chemical and biological engineering.

Dr. Piret is a leading scholar in biotechnology, specializing in multi-disciplinary mammalian cell culture research that uses technologies ranging from molecular biology to bioreactor engineering in order to advance research to improve human health outcomes. His group develops and optimizes mammalian cell culture processes to produce cells or proteins intended for the treatment of diseases. Actively collaborating with scientists and industries throughout his career, Dr. Piret has contributed to several successfully commercialized innovations.

In 2001, Piret was the founding bioengineering theme leader of Canada's Stem Cell Networks of Centres of Excellence and led projects that networked multidisciplinary stem cell research across Canada at multiple universities. Piret currently serves as the bioengineering leader of CellCAN, a network of Canadian researchers who work to enable cell therapy clinical trials for major diseases such as cancer, diabetes and heart disease.

With Bachelor's degree from Harvard University in applied mathematics to biochemistry and doctoral degree in chemical engineering from MIT, Dr. Piret joined UBC in 1989. Dr. Piret has supervised more than 40 graduate students and 20 postdoctoral fellows. His lab has trained more than 100 undergraduate thesis, co-op and international students. For his dedication to students, Piret was named a Faculty Member of the Year in 2006 by the UBC Engineering Co-op Program and received the Chemical & Biological Engineering Teaching Excellence Award in 2012. Other notable distinctions include becoming a Fellow of the Chemical Institute of Canada and winning the 2012 Engineering Conferences International's Cell Culture Engineering Award, the 2015 UBC Applied Science Dean's Award for Excellence in Service, and a UBC Killam Faculty Research Fellowship and Prize.

Peter Wall Research Award

The Peter Wall Institute for Advanced Studies Wall Scholars Research Award was received by Dr. Vikramaditya Yadav. Dr. Yadav received his PhD from Massachusetts Institute of Technology (MIT), he conducted his post-doctoral research at Harvard University, and has joined the faculty of Chemical and Biological Engineering in the University of British Columbia in the summer of 2014. His research focuses on the development of 'biosynthonics'.

Dr. Yadav and his group recently embarked on the development of a novel brain-on-chip device for preclinical testing of anti-neurodegeneration drugs for treatment of Alzheimer's disease, a project which will form the centerpiece of his scholastic residence at the Peter Wall Institute for Advanced Studies. This project combines mathematical modeling and analysis with key concepts from stem cell bioengineering, micro-manufacturing and engineering design, and represents a methodological advancement that will potentially open new frontiers in biomedical engineering.

The Medicine Maker Power List

Dr. Vikram Yadav was nominated by The Medicine Maker Magazine readers and then selected by a jury panel to the Medicine Maker's Power List 2015. The Medicine Maker noted that 'Biosynthonics' – a novel paradigm for discovering and synthesizing potent bioactive molecules – is a focus of Vikramaditya's research group. The group also focuses on formulation and assembly of drugs and their translation to certain pathological conditions.

100 the Medicine Maker Power List 2015

NSERC Create

Chemical and Biological Engineering Professor Vikram Yadav is part of a multi-disciplinary UBC research team that has received NSERC CREATE funding this June for their project, Ecosystem Services, Commercialization Platforms and Entrepreneurship (ECOSCOPE). The project is led by UBC Microbiology Prof. Steven Hallam.

NSERC Collaborative Research and Training Experience (CREATE) grants prepare students and postdoctoral fellows for careers in industry, government and academia through value-added professional and personal skills training.

This is the second NSERC CREATE collaboration involving a CHBE faculty. In 2014, NSERC CREATE announced funding for NanoMat of which CHBE Dr. David Wilkinson is a Principal Investigator.

Canadian Society of Rheology Mason Award

The Canadian Society of Rheology announced Dr. Savvas G. Hatzikiriakos as the 2014 Stanley G. Mason Awardee for his outstanding contributions to the advancement of the science of rheology. A Symposium took place in May 2015 in McGill University where many rheology related research topics were discussed and finalized with Dr. Hatzikiriakos' plenary talk.

Associate Editor - Physics of Fluids

Professor Savvas G Hatzikiriakos has being appointed Associate Editor of Physics of Fluids effective January 1, 2016. Physics of Fluids is one of the most prestigious journals in the area of fluid mechanics and part of the AIP (American Institute of Physics) Publishing, one of the world's leading not-for-profit scholarly publishers in the physical sciences.

Water's Next Award 2015 for Dr. Mohseni

The award was presented by Water Canada Magazine to acknowledge the achievements and ideas of individuals and companies that successfully work to change water in Canada by making safe, healthy water resources a priority.

Dr. Mohseni is the Scientific Director of RES'EAU-WaterNET. RES'EAU-WaterNET is Canada's first and only multidisciplinary research network devoted exclusively to developing innovative, affordable technologies for providing clean drinking water to small, rural and First Nations communities. RES'EAU-WaterNET is funded by the Natural Sciences and Engineering Research Council (NSERC) in partnership with UBC.

Engineering Excellence Celebration 2015

Alumni Lifetime Achievement

Dr. Amit Chakma earned his MASc and PhD in Chemical Engineering from UBC, graduating in 1987. The author of more than 100 articles, he is an expert in areas related to petroleum research and energy management. For his many achievements, Dr. Chakma has been recognized with Canada's Top 40 Under 40 Award, and as a fellow of the Canadian Academy of Engineering. He received the Queen's Diamond Jubilee Medal in 2012 in recognition of his contributions to Canadian post-secondary education. In 2014, he was named among RBC's Top 25 Canadian Immigrant Award winners, and became the first Canadian university president to receive the Michael P. Malone International Leadership Award, sponsored by the Association of Public and Land-grant Universities.

Future Alumnus M. Hafizur Rahman

M. Hafizur Rahman is a PhD candidate in Chemical and Biological Engineering (CHBE) and served as the CHBE Graduate Students Club President in 2013–2014. In his time at UBC, Hafiz has distinguished himself as a dedicated, effective, and exemplary leader through his service to his department, his peers, and the greater university community. Hafiz's work as a Teaching Assistant is regarded as nothing less than exceptional and his efforts were rewarded in 2014 with UBC's Killam Graduate Teaching Assistant Award, for which he was nominated by faculty within his department. Hafiz's research focus is hydrodynamics and modeling of a dual fluidized bed reactor for biomass steam gasification.

Emeriti Faculty, Dr. Richard Kerekes

Dr. Richard Kerekes, a world leading pulp and paper engineer, is Professor Emeritus with CHBE where he taught from 1978. Retired, Dr. Kerekes is still active at UBC, mentoring new faculty, UBC Pulp and Paper Centre directors, assisting with academic supervision of graduate students and postdoctoral fellows, and facilitating relationships between UBC and the pulp and paper industry. For his achievements, research, and service to the pulp and paper community, he has received numerous awards and honours. In 1989, Dr. Kerekes received APEGBC's Meritorious Achievement Award and, in 1993, he was elected a Fellow of the Canadian Academy of Engineering. He holds two gold medals, the John S. Bates Memorial Gold Medal from the Pulp and Paper Technical Association of Canada and the Gunnar Nicholson Gold Medal from the US Technical Association of the Pulp and Paper Industry —each, the highest honour in its respective association.

Fellow of the **ROYAL SOCIETY OF CHEMISTRY**(FRSC) UK

Dr. Joe R. H. Zhao, an Adjunct Professor of Chemical and Biological Engineering Department of UBC, has recently been admitted as a Fellow of the Royal Society of Chemistry (FRSC) UK for his outstanding contributions to the advancement of chemical science.

Dr. Zhao is Chief Scientist and CEO of Tri-Y Environmental Research Institute, a company he founded and has led since 1998 focused on invention and commercialization of new chemistry-based technologies.

Dean's Award for **Excellence in Service**

The Dean's Award for Excellence in Service recognizes excellence in service and outstanding contributions by staff members of the Faculty of Applied Science. A personalized plaque and a $1,000 award will be available each year for a staff recipient in each of three employee groups: (1) technical staff, (2) clerical / secretarial staff, and (3) management / professional staff. The names of the recipients are also memorialized on a plaque displayed in the Dean's Office in the Fred Kaiser Building along with past and future winners.

Warm Congratulations to Jamie Piret (faculty) and Doug Yuen (technical staff). Both received the Dean's Award for Excellence in Service in June 2015.

BCWWA
BC WATER & WASTE ASSOCIATION

Compiled by Jeff MacSween and Shona Robinson, BCWWA UBC Student Chapter

On March 29, 2015 the UBC BCWWA Student Chapter held the second annual Junior Student Design Competition. The event drew nine undergraduate teams from UBC's first and second year engineering programs. Students were tasked to design an in-stream device to re-aerate water following oxygen depletion by a sawmill. The potential of engineering solutions to solve environmental challenges was emphasized, giving these students a new perspective on their field. Teams presented their designs to the judges and then tested their model designs in UBC's hydraulics lab. Creativity, cost-effectiveness and aeration capability were rewarded, with the grand prize going to Team Rocket for their "Watergate" design. Congratulations to the winners, and we can't wait for next year's competition!

The Department is a supporter of the annual BC Water and Wastewater Association Student Design (BCWWA SDC) competition. The BCWWA SDC promotes **"real world" design experience** for students interested in pursuing a career and/or education in water and wastewater engineering and sciences. CHBE Student Team ENKI submitted a design for a resource recovery system for the City of Kelowna Wastewater Treatment Plant. The design focussed on anaerobic digestion of fermented primary sludge and waste secondary sludge to produce biogas.

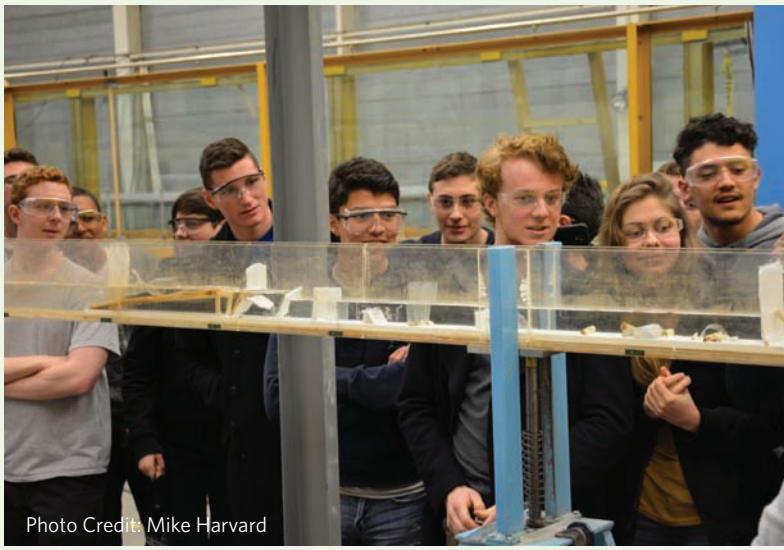


Photo Credit: Mike Harvard

UBC undergraduate students competing in the Junior Student Design Competition

The competition components included a presentation, hosted at CHBE, and a report and Team Enki placed third – well done!

The team, David Goertsen, Marc Apduhan, Nathan Chan, Adrian Serrano and Elizabeth Wong were supported by faculty member Dr. Anthony Lau and Jeff Chan from Metro Vancouver.

UBerCoolecular

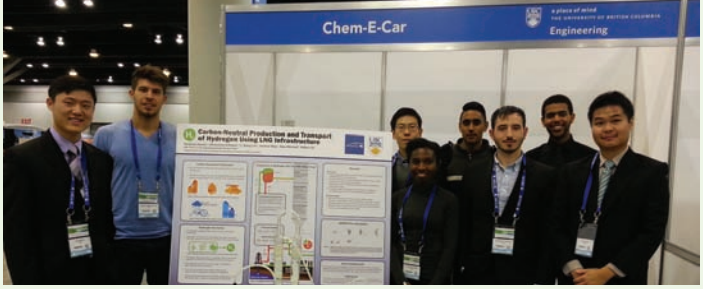
2015 Biomod Team members (left to right) - Peter Xu, Amin Shahali, Dan Fu, Alyssa Fegen, Isabelle Luvalle-burke, Jeffrey Boschman, Ileana Co and Nathan Chan.

BIOMOD Competition

The BIOMOD competition is an annual international biomolecular design competition organized by the Wyss Institute for Biologically Inspired Engineering at Harvard University. The multidisciplinary UBC BIOMOD team (UBerCoolecular) entered the competition for the first time in 2015, with their project entitled Modular and Triggerable Nanostructures for Simultaneous Multiple Drug Delivery. The motivation for this project was to design a drug delivery system for multiple cancer drugs to target cancer cells, limiting the side-effects of chemotherapy. The nanostructure was composed of liposomes as a drug carrier, DNA origami as a robust and flexible dimerization joint, and gold nanoparticles as a trigger for drug release. The team placed Silver and won first place in the audience choice category!

UBC Chem-E-Car

LNG Conference



Chem-E-Car Team members at the 2015 LNG Competition

The Third Annual LNG in BC Conference provided a meeting place for exhibitors, businesses, government leaders, and others from the industry to discuss the LNG facilities in BC set to begin operation as early as 2020. This year, the conference included an Innovation Engineering Competition for post-secondary students, Gamechanger. The UBC ChemECar team participated in the competition with a poster presentation.

The ChemECar team uses clean energy systems such as hydrogen and metal-air batteries to power a small-scale automobile that competes in the annual American Institute of Chemical Engineers (AIChE) ChemECar Competition. Therefore, the team envisioned that part of the natural gas extracted in BC could be used in the steam reforming and gas shift reactions to produce hydrogen gas. The hydrogen gas produced could be used in fuelling stations to power automobiles and other equipment, as a replacement to using traditional fossil fuels. In addition, the hydrogen gas could be transported together with natural gas in the same pipelines, making use of existing infrastructure. Due to the different densities of hydrogen and natural gas, the hydrogen and natural could be easily separated at the working site.

We produced a 3D prototype of our idea to show during the presentation. We were able to network with different companies that were present.

There were great ideas from all student teams present at the competition. Therefore, we were pleased to hear about our 2nd place standing amongst all the teams that participated. The team received a certificate and $3000, which will go towards funding for the team.

We would like to thank the Department of Chemical and Biological Engineering, along with the professors for providing support and advice during this endeavour.

Department Scholarships and Awards

LEFT TO RIGHT: Bhushan Gopaluni, Naoko Ellis, David Houghton, Mary Kenny, Torsten Jaccard, Lee Rippon, Jonathan Doan

THOMAS BENNETT AWARD

The 2015 award recipients for the Thomas Bennett Award were David Houghton and Torsten Jaccard. In attendance at this year's ceremony were 2015 award recipients David Houghton and Torsten Jaccard, 2014 award recipient Lee Rippon, Tom's mother Mary Kenny, Chemical and Biological Engineering Professors Dr. Naoko Ellis and Dr. Bhushan Gopaluni, and Jonathan Doan of UBC's Applied Science Development Office.

The awards were officially 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. During his time at UBC, Tom made a positive and lasting impression on students, staff, and faculty in the Faculty of Applied Science, many of whom were devastated by his untimely death in a tragic mountain climbing incident on April 1st, 2010, at the age of 26.

THE GRACE MENTORSHIP AWARD

The Grace Mentorship Award recipient was Jan Laesecke, MASc student. The award is offered to a graduate student or post-doctoral fellow, who has been highly effective in mentoring undergraduate students in the Department of Chemical and Biological Engineering.

JOHN R. GRACE GRADUATE SCHOLARSHIP

The John R. GRACE Graduate Scholarship was awarded to Eric Jia, PhD student. The award is 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.

JOHN R. GRACE FELLOWSHIP

The John R. GRACE Fellowship was awarded to Shiva Madadkhani, MASc student. The award is provided to a graduate student exceling in academics.

CHAD BENNINGTON MEMORIAL SCHOLARSHIP

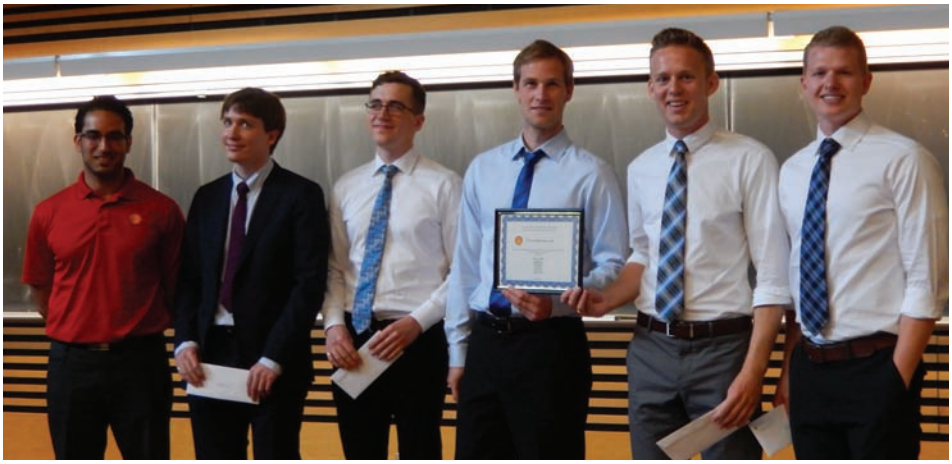
The Chad Bennington Memorial Scholarship was shared by Matthew Galea and Bao Man. The award is named in honour of Professor Chad Bennington, a faculty member in the Department of Chemical and Biological Engineering who passed away suddenly in 2010. The Chad Bennington scholarships are awarded to students who demonstrate interest, leadership and academic accomplishment in pulp and paper related technologies.

Congratulations to the 2015 recipients of Chemical and Biological Engineering Department Scholarships!

GRADUATION **Day**

The Graduation Day Reception was held in the CHBE atrium and in auditorium CHBE 101. It was an opportunity to recognize the achievements of exceptional students as well as some exceptional teachers. Speeches and awards were made in CHBE 101 and there were delicious refreshments in the atrium afterwards.

The Shell Awards and the ICGH Hydrates awards are given out as prizes to the best capstone design project teams on Graduation Day. In 2015, the three winning teams were:



SHELL BEST BIOPROCESS DESIGN – Green Methanol Synthesis: Whaley Armitage, Philip Chow, Phillip Holmberg, Hsien Huang, Tyler Pfanner, James Radke, Connor Reid, Austin Webster

The Green Methanol Synthesis team also won the 2015 Design Poster Award!

THE WINNING ICGH HYDRATES TEAM – Petrolatum from Syngas: Clarin Houle, Haseullin Kim, Bao Liu, Andrew Ma, Sarpreet Pahal, Daniel Son, Chu Jie Zhu.

The Green Methanol Synthesis team also won the 2015 Design Poster Award!

SHELL BEST CHEMICAL PROCESS DESIGN – Gas to Liquids using Fischer-Tropsch Synthesis: Saad Khan, Tim Cai, Farhana Abd Ghaffar, Lilian Sia, Juana Gonzales, Wen-Jin (Joanne) Chan, Yuan (Gary) Wang, Indah Andriani

STUDENT AWARDS AND COMPETITIONS

Teaching awards are made in recognition of excellence in teaching, as voted by the student body each year. The 2015 teaching awards went to Dr. Vikram Yadav and Dr. Kevin Smith.

Congratulations to all recipients!

It was a great honour for the Chemical and Biological Engineering department to have two of its students as valedictorians for the May and November convocations in 2015. Congratulations to Negin Tousi and Kareem Awad!

Dr. Peter Englezos, head of the department, was Macebearer for the May convocation. The University Mace is a symbol of the authority of the Chancellor. The Macebearer leads the Platform Party, which includes the Chancellor, the President, and other dignitaries, onto the stage for the Congregation ceremonies.

LEFT TO RIGHT:
Peter Englezos,
Hassan Sharifi,
Lindsay Gordon

CHBE APSC
Rising Stars

The UBC APSC Rising Stars of 2015 are people passionate about their chosen field – architecture, landscape architecture, community and regional planning, engineering and nursing. They are individuals that inspire others by making meaningful contributions to the betterment of society.

In 2015, two of our CHBE students were honoured as UBC APSC Rising Stars. Hafiz Rahman is a PhD student who has served as a CHBE Graduate Club President, launched the Graduate Club Seminar Series. He has been the recipient of numerous awards during his time at UBC including the AMS Just Desserts Award 2013, Killam Graduate Teaching Assistant Award 2014, Graduate Student Leadership Award 2014, and Outstanding Future Alumnus Award 2015.

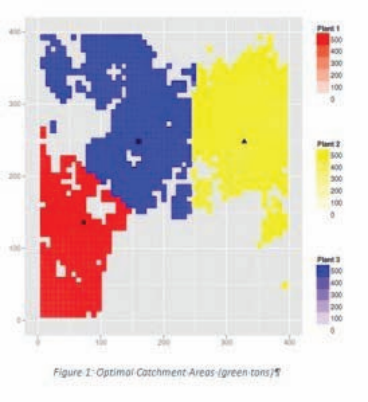
Negin Tousi is part of the graduating class of 2015 in Chemical and Biological Engineering. After a successful term as President of the CHBE Undergraduate Club she went on to serve as Vice President of External Affairs of the UBC Engineering Undergraduate Society.

Congratulations to both Negin and Hafiz on well-deserved recognition for their achievements to date. We wish them well in all their future endeavours.

Best Oral Presentation at
ADCHEM 2015

A paper presented by CHBE Graduate student David Zamar won Best Oral Presentation Award at ADCHEM 2015, the 9th International Symposium on Advanced Control of Chemical Processes. The Symposium took place in Whistler, BC, June 7 to 10, 2015.

"Robust Optimization of Competing Biomass Supply Chains under Feedstock Uncertainty" was co-authored by David Zamar, Bhushan Gopaluni, Shahab Sokhansanj and Nathaniel Newlands. The paper presented a robust approach for optimization under uncertainty and applied a method to address the problem of analyzing, subject to stochastic demand and supply in addition to numerous constraints, a system of three biomass supply chains competing for the same feedstock. The energy demand and feedstock supply for each power plant were considered uncertain, but with known distributions. The optimal catchment areas identified by the solution satisfied 90% of the demand, with a probability of 95%.



Graph of optimal catchment areas from winning presentation

APSC 3MT
winner Jeanette Leeuwner

Congratulations to CHBE's own Jeanette Leeuwner on winning first prize at the Faculty of Applied Science 3 Minute Thesis (3MT) competition, held on March 3. Her winning presentation title was. "Engineering Fuel Cells for the Future."

The 3MT competition aims to assist current graduate students with fostering effective presentation and communication skills by presenting, in just three minutes, the breadth and significance of their research project to a non-specialist audience.

CHBE professor Dr. Naoko Ellis said "...not only was I inspired by some of the cool research going on at UBC, but I also learned tips on concise communication. What a powerful skill to have".

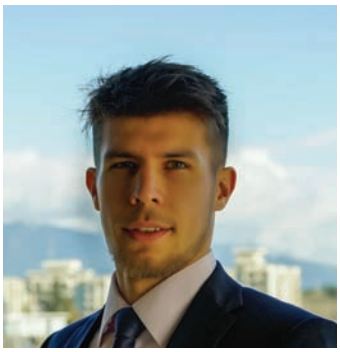
Applied Science Entrepreneurial PhD Program Winners

Four CHBE PhD candidates were awarded full entry into the new Applied Science Entrepreneurial PhD (e-PhD) Program. The e-PhD is an initiative which aims to equip participants with the necessary business, analytical and entrepreneurship skills to tame inventive research ideas from the lab to the market. The competition required creating a one-minute video pitch on why they wanted to be a part of this new innovative program and the support of their supervisors.

Saad Dara, in the fourth year of his PhD candidacy, is working on a waste-to-value innovation that converts waste carbon dioxide and high salinity waste-water into value-added chemicals and desalinated water for re-use. At commercialization the technology is anticipated to mitigate the impact of greenhouse gas emissions in excess of 1 million tonnes per year and reduce fresh water use in excess of 2 billion litres per year.

Majid Keshavarzfathy, in the second year of his PhD candidacy, is designing a water-disinfecting UV-LED reactor to generate clean drinking water. Using computational fluid dynamics software, he aims to determine a practical and accurate model for the simulation and design optimization of a UV-LED reactor. Keshavarzfathy hopes that his research will lead to the creation of a design which is smaller, safer and more environmentally friendly than the existing UV water treatment system.

Amin Taheri, in the last year of his Four Year Doctoral Fellowship (4YF) program, is developing novel production techniques for advanced carbon nanomaterials to meet an increasing demand in clean-energy devices such as batteries, fuel cells, and supercapacitors. With several articles published in renowned materials science journals, Taheri is keen to commercialize the processes he has developed in the lab, and make the future more energy-efficient and sustainable.



Vasilii Triandafilidi is a PhD candidate in Chemical and Biological Engineering (CHBE) who is advancing new hydrophobic polymeric surfaces that can make various medical devices, such as artificial pacemakers, safer to implant into the human body and more resistant to failure. He is the CHBE Graduate Student Council's VP Academic and the chair of the CHBE Research Day 2016, a full-day engineering research showcase aimed at catalyzing academia-industry collaboration.

WEST
WATER & ENVIRONMENT STUDENT TALKS

By Reza Rezaei

TOP FROM LEFT: Aline Bennet, Michael Havard, Reza Rezaei, Shona Robinson. BOTTOM FROM LEFT: Jeff MacSween, Ruihuan (Sarah) Ning, Jessica LeNoble, Neshat Basiri, Rony Das, Olenka Forde

Water and Environment Student Talk (WEST) conference is an interdisciplinary conference for students in water and wastewater to present their research. This conference was organized by UBC Civil and Chemical Engineering graduate students and held at UBC's Vancouver Campus in Liu Institute for Global Issues June 8th and June 9th,2015.

The second annual WEST conference brought together 92 attendees, with widely varying backgrounds from northwestern Universities, to the UBC Vancouver campus. The WEST hosted over 40 presentations on research and novel advances in contemporary issues and industry activities.

The conference goal was to encourage students to share their work with industry representatives and academics from related fields and to foster an understanding of how one's research project fits into the larger water sphere and other projects.

The Canadian Association Water Quality (CAWQ) Phillip H. Jones award was conferred to recognize quality work and presentation. Sean McBeath received the People's Choice Award for Best Presentation.

This conference included oral and poster presentations, keynote speakers, a panel discussion and a workshop. Also organized was a Stanley Park tour, an opportunity to enjoy the beauty of Vancouver!

For details on the WEST 2016 Conference, visit **west-conference.ubc.ca**

2015 Graduate Council in a Hiking Trip

CHBE Grad Council

Hiking is one of the most popular and enjoyable experiences available in Vancouver. In the summer of 2015, the CHBE Grad Council (previously known as CHBE Grad Club Committee) organized three hiking trips: Deep Cove Quarry Rock, Stawamus Chief, and Garibaldi Lake. The graduate students welcomed the events with great enthusiasm as it had been a while since the last hiking activity by the CHBE Grad Council.

CHBE Graduate students are known for their strong skills at playing Foosball. There were 10 teams competing for the best players in the department. At the end, the team formed by Majed and Jesse won the tournament.

CHBE welcomes the new graduate students every year through a half-day orientation event. The CHBE Grad Council organizes events through the year. Graduate school offers outstanding academics and research as well as the opportunity to make life-long friendships.

Carmen Bayly, Vice President Social of CHBE Grad Council organized the Pumpkin Carving event. The highlight of the event is a fluidized bed carved by Dr. Naoko Ellis and Dr. Norman Epstein.

The annual Graduate Student Christmas Party is an opportunity for Grads to celebrate collegiality and the season's festivities. The students invited staff and faculty to share a luncheon at St. John College's dining hall. The Christmas party MC was Jun Sian Lee, the Grad Club President. Event highlights included ice breaker games and a solo flute performance by Bill Cheng who played Johann Pachelbel's Canon in D Major.

Third Year Field Trip

By Mike Tian – 3rd year Undergraduate Representative, JP Faucher – Vice President, Undergraduate Club

On the brisk morning of September 27th, more than 90 third year CHBE students set off on a week-long field trip across Western Canada. The students split into two groups and went their separate ways. One group traveled from Vancouver through Kamloops and Jasper to Edmonton, and the second traveled through the BC Southern Interior, Castlegar, and the Kootenays. Both groups eventually met in Red Deer, and traveled together to Calgary to finally return to Vancouver after a long but inspiring week.

The Edmonton group had their mettle tested on the very first day with a 14-hour long bus ride from Vancouver to Alberta's provincial capital. There were no reports of regretted decisions.

On the first day of tours, the Castlegar group met with the engineering, environmental and management staff from the Zelstoff Celgar Pulp Mill. The students were given a detailed presentation on the mill's history, vital processes, environmental processes, and economic situation of the pulp and paper industry. After the presentation, students were given a very thorough tour of the mill itself. Students saw firsthand the complex processes the mill employs to produce northern bleached softwood kraft pulp from raw wood, as well as the mill's extensive effluent treatment system. The Edmonton group's first tour was at Dow Chemical in Fort Saskatchewan. The morning started with a brief presentation given by a very knowledgeable plant leader and followed by a walking tour of the Polyethylene plant where students had the opportunity to visually observe the different stages of polyethylene production and understand the effects of some parameters on the product quality. Afterward, a bus tour of the Hydrocarbon Plant was given where students were able to appreciate the size of the processing units such as a significantly tall distillation column. Students also had the opportunity to meet with

recently graduated students, one being from CHBE. The afternoon tour was at Enerkem Alberta Biofuels. This waste-to-biofuel facility is located at the Edmonton Waste Management Center (EWMC) where Enerkem converts non-recyclable and non-compostable waste into methanol. A tour of the site was provided and students were able to exchange with two passionate Enerkem process engineers. Although a walk around of the plant was not possible due to upgrades in progress, students were impressed by the complexity and size of this newly developed process.

On the second day of tours, the Edmonton group toured Agrium's Redwater Operation. A number of process engineers and plant supervisors facilitated walking tours of the Monoammonium phosphate and the nitrogen-based fertilizer production facilities. A safety officer also provided an interactive presentation on safety where students were able to try on industrial safety equipment. A lunch was provided with the opportunity to discuss further with plant engineers and HR personnel. The Castlegar group traveled to neighbouring Trail for a tour of Teck's Trail Operations. Students were given a detailed look at how raw ore was processed into market ready zinc and lead. Students were also shown the importance of environmental protection and the efforts Teck goes through to keep its environmental impact at a minimum. The next stop for the Castlegar group was Sparwood BC, the location of Teck's Coal Mountain facility. Students were shown how metallurgical coal is extracted and processed.

The two groups met up again in Red Deer, Alberta for more site visits. The first was Johns Manville's Innisfail plant. The students were guided through the entire process of glass fibre insulation products. Students appreciated the possibility to see the different steps necessary to transform waste glass into an insulation product used in any typical home. The next site

was Shell's Caroline Gas Plant where students were given a detailed presentation on Shell's operations both local and international, and on how Shell is adapting to the ever changing energy needs of the world. The presentation was followed by a tour of the gas plant where students could see the various process units.

When the tours concluded, the two groups traveled to Calgary for a banquet dinner. The banquet took place at the International Hotel in downtown Calgary. Students had an opportunity to network with Shell engineers and learn about life as professional engineers. Shell's General Manager of Insitu Operations, Rej Tetrault delivered the keynote presentation on how to incorporate sustainability in engineering in the oil and gas industry, and presented a case study highlighting Shell's efforts in this area. For the closing remarks, Shell's Water Treatment Specialist J.C. Bourgeois shared his experiences transitioning from student to industry expert.

Overall, the field trip was a great success. Students appreciated the exposure to different types of industrial operations, and to industries which they didn't know about prior to the field trip. Students were very impressed with the size and complexity of the plants, as well as the generous hospitality shown by all the hosts. The field trip also gave students a great opportunity to bond with their classmates.

I'd like to thank Marlene Chow and JP Faucher for their tremendous efforts, without which the field trip would not have been possible. I would also like to thank Michael Lu of Shell Canada, Ralph Lunn at Zellstoff Celgar, Zia Obaid at Agrium Redwater, Carol Vanelli Worosz at Teck Trail, Daniel Tailor at Teck Coal Mountain, Brian Mills at Enerkem, Angela Morin at Dow Chemical, and David Vander Plaat at Johns Manville for their help coordinating the site tours.

Last but definitely not least, I would like to thank Shell Canada for their very generous support of this unique educational experience. Their support was made through the Shell Canada Campus Ambassador Program (CAP). CAP is a national initiative through which Shell proactively works with select post-secondary institutions with the aim of providing strategic and meaningful financial support, building relationships with academics and engaging the best and brightest students. Since 2006, the CAP has helped students in UBC's Engineering programs interact with industry, exposing them to the realities of working in their various fields.

The Oil&Gas Initiative

UBC's student connection to the industry

By Ayesha Shahzad, President Oil&Gas Initiative

The Oil&Gas Initiative (OGI) is a student group that aims to inform the UBC community about the oil and gas industry. The OGI engages students and professionals through group discussions, technical talks, and networking events. The group also runs the UBC Student Chapter of the Society of Petroleum Engineers.

The Alberta Student Energy Conference (ASEC), hosted by the University of Calgary, is a one-day student-organized conference that brings students and industry professionals together. The conference provided students with excellent educational talks, networking opportunities, a career fair and a case competition to focus on industry issues.

Picture from Alberta Student Energy Conference (ASEC)

A team from The Oil&Gas Initiative participated for the first time in the Case Competition at the University of Calgary on March 19 & 20 during ASEC. The competition topic was assessing the establishment of a fictitious Chinese national oil exploration company in the Canadian Petroleum Industry. UBC competed with 16 other teams from across Canada. The UBC team included CHBE students Ayesha Shahzad, Fahim Salam, Zishan Abdullah, Aaron Tan and Christine Yi.

In the fall of 2015, OGI events included a documentary screening, a webinar and technical talks by industry professionals. The documentary, "Switch", looked at the future of the energy industry, energy technology and the challenges associated with transitioning to renewable energy. The webinar, run by a chemical engineer with ConocoPhillips, discussed how to approach engineering problems in the oil and gas industry.

Liquefied natural gas (LNG) is an emerging industry in BC and the OGI has been working to educate students and engage professionals working in the field.

For further information on the Oil & Gas Initiative please email info@oginitiative.ca

2015 Oil&Gas Initiative team members

2015 Ride for **Clean Energy**

August 8th, 2015 marked the third annual Ride for Clean Energy benefitting the Tyler Lewis Clean Energy Research Foundation. Thirty participants including, seven CHBE summer and graduate students, embarked on the beautiful 75 km ride from Harrison Mills. Navigating through the scenic 'Harrison to Home' route, the ride ended in Maple Ridge. The CHBE riders included Saad Dara (second-time rider), Adrian Serrano, Farhang Hesvaderani, Lucie Solnickova, Arman Bonakdarpour, Tenghu Wu, Nathanial Williams and Sean McBeath (third-time rider), collectively raised over $2,900. Doug Yuen, volunteer behind the scenes, facilitated the transport of bikes.

The Tyler Lewis Clean Energy Research Foundation is a non-profit organization that annually awards a $10,000 scholarship to a graduate student enrolled in a Canadian post-secondary institution, in the field of renewable/sustainable energy research. The Foundation and Ride were established in memory of Tyler Lewis, a CHBE graduate student who tragically past away in 2012.

Visit www.tylerlewis.ca to find out more about Tyler Lewis Clean Energy Research.

CHBE Undergrad Council 2015

The Chemical and Biological Engineering Undergraduate Council is comprised of executive and officer positions including sports, industry, academic, and social representatives. The undergraduate council plans various events such as CHBE industry nights, Beef and Pizza sessions (academic feedback sessions), various social events, as well as helping with registration of teams in various sport events. In addition to working closely with the department, the undergraduate council also works hand-in-hand with the UBC Engineering Undergraduate Society to enhance the student experience in engineering.

Iron Ring Ceremony

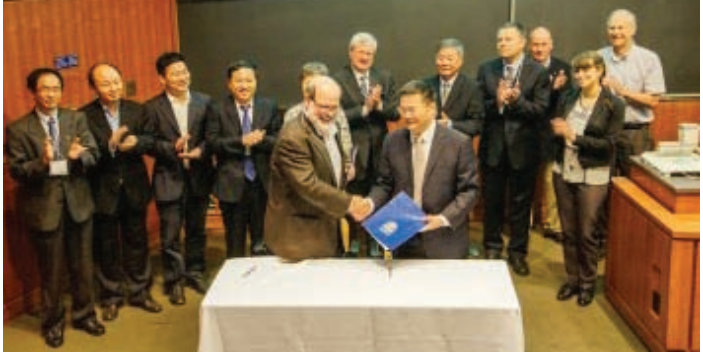
The Iron Ring Ceremony for graduating engineers took place on Thursday March 19 at the Queen Elizabeth theatre. The tradition of "Calling of an Engineer" goes back to 1922, was initiated by Mr. Rudyard Kipling, aims to connect Canadian Engineers in a special way. "The ring symbolizes the pride which engineers have in their profession, while simultaneously reminding them of their humility. 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." – Camp No.1, Toronto

APSC
Open House 2015

The annual Engineering Open House event on November 30th, 2015 drew hundreds of students and parents. The participants attended lab tours, presentations and demonstrations in all engineering departments. CHBE provided fantastic lab tours led by Dr. Gabriel Potvin and Juana Gonzales who presented the various undergraduate Chemical and Biological engineering laboratory experiments. The experiments included the distillation column, viscometer, packed bed, and heat exchanger with a fun demonstration of nitrocellulose (a.k.a guncotton). The flash ignitions created great excitement in the tour audiences! The building atrium buzzed with activity. CHBE student volunteers and staff member, Marlene Chow, demonstrated how to make delicious ice cream using liquid nitrogen. Graduate and undergraduate students, and clubs demonstrated their projects and research. Participating clubs included ChemEcar, Oil&Gas Initiative, and UBerCoolecular. Additionally, the project manager of Res'eau, Megan Wood, demonstrated the inside of their mobile research lab. This state-of-the-art lab that contains several water treatment options such as filtration, ion exchange, activated carbon absorption and both conventional and vacuum UV.

In the Kaiser atrium, CHBE students and faculty members, discussed the chemical and biological engineering programs to prospective students and their parents. They presented a demonstration of a fluidized bed reactor with air flowing through glass beads.

CHINA – Canada Joint Centre for BioEnergy Research and Innovation



Signing of the MOA for the China-Canada Joint Centre for BioEnergy Research & Innovation: John Hepburn, VP Research and International, UBC, and Tianwei Tan, President Beijing University of Chemical Technology

The opening of the China-Canada Joint Centre for BioEnergy Research & Innovation (C-C JCBERI) collaboration was announced at the 5th International Conference on Biorefinery (www.icbb2015.org).

The Centre will provide a platform to foster bioenergy technology development, maturation, demonstration and commercialization in both Canada and China through collaboration.

The C-C JCBERI is hosted by UBC in Canada and Beijing University of Chemical Technology (BUCT) in China. In addition to research institutions, partners include companies, not-for-profit organizations and stakeholders in the bioenergy sector in both countries. The collaboration involves more than 40 faculty members from UBC, BUCT and nine other Chinese institutions. The Director of the new Centre is Dr. Xiaotao Bi of UBC's Department of Chemical and Biological Engineering.

Dr. Wilkinson's Research Team Receives WD Funding

LEFT TO RIGHT: Dr. Peter Englezos, Dr. Wilkinson, Honourable Michelle Rempel, Minister of State for Western Economic Diversification, Prof. Helen Burt – Associate Vice President Research & International, UBC

A UBC research team led by Chemical and Biological Engineering Professor David Wilkinson received $450,000 on March 3rd from Western Economic Diversification Canada. The funding supports the commercialization of technologies that will support sustainability in the oil and gas industries.

The UBC research team led by Professor David Wilkinson includes Dr. Arman Bonakdarpour, Dr. Alfred Lam and PhD Candidate Saad Dara

Funding will be used to develop and commercialize equipment to convert by-products of the oil and gas industries into reusable materials, promoting reduced environmental impact and sustainable resource development in Western Canada. The equipment, which has been developed by UBC at a small scale, creates value from carbon dioxide emissions and wastewater generated by the oil and gas industries, provides an innovative approach to industry challenges and creates significant economic opportunity.

The team previously received $500,000 in funding from the Climate Change and Emissions Management Corporation (CCEMC) to further the new technology towards commercialization. The project was one of 20 finalists chosen from over 344 international submissions in 2014.

LEFT TO RIGHT: Saad Dara, Honourable Michelle Rempel, Dr. Arman Bonakdarpour

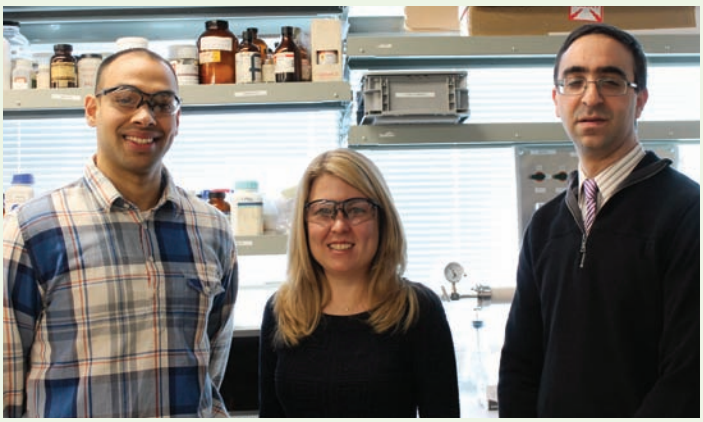


Photo Credit: Eric Jia

Tyler Lewis Lounge Opens!

Tyler Lewis was a PhD student at UBC in Chemical and Biological Engineering pursing his lifelong passions for the environment and sustainability. He grew up in rural British Columbia and was taught the importance of environmental awareness from a young age. Recognizing the world's impending energy crisis, Tyler believed that, as engineers, "it is our duty to address global issues, such as climate change, in a manner that is environmentally and socially sound." Tragically, Tyler lost his life in December 2012 in a skiing accident.

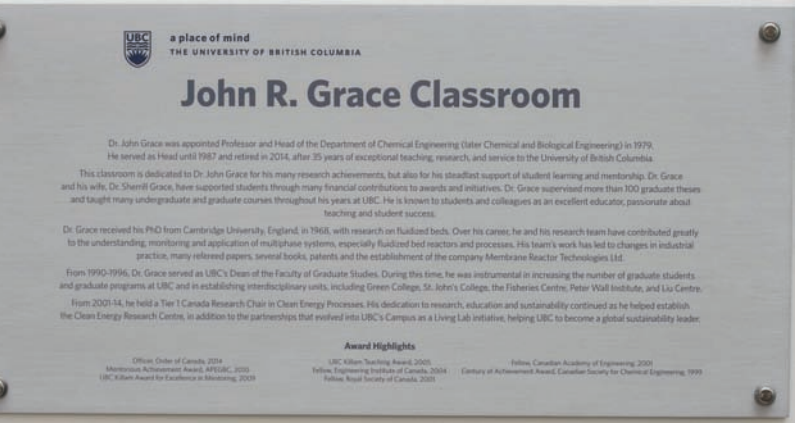
In honour of the place where Tyler was realizing his career goals, his parents Lynn Prindle and Graham Lewis generously donated the funds and furniture needed to create a welcoming graduate student lounge on the sixth floor of the CHBE Building. This room will provide students with a place for solo and collaborative studying, for relaxing, playing foosball, warming a meal and meeting friends.

The lounge officially opened on April 16, 2015, when a short dedication event was held with staff, faculty, students, friends, and Tyler's parents. The event was full of warm memories of Tyler, and his passion for learning, living and community. Many friends commented that the now lively space was simply an extension of Tyler's strong sense of community. Indeed, Tyler's presence is throughout the room through his photography which his parents have generously provided and shared.

The Department of Chemical and Biological Engineering would like to once again express their sincere condolences to Tyler's family, as well as our own regret at losing, much too early, a talented student, colleague and friend. We are grateful for the opportunity to be a small part of his legacy, and to provide a collegial place for current and future graduate students to call home.

The Tyler Lewis Clean Energy Research Foundation provides an annual grant for a post graduate research project in the area of clean energy research. Please visit www.tylerlewis.ca for details.

TYLER LEWIS
CLEAN ENERGY RESEARCH
FOUNDATION



John R. Grace Classroom

On September 3rd, 2015, the Department of Chemical and Biological Engineering named Rm 102 in the CHBE Building after Dr. John Grace in recognition of his work at UBC. A plaque was also placed in the Bioenergy Research and Demonstration Facility to acknowledge Dr. Grace's work in establishing that facility and his work related to clean energy.

John arrived from Mc Gill in 1979 when he was appointed Head of the UBC Chemical Engineering Department. The Department expanded and prospered under John's capable leadership; the graduate student enrolment almost doubled, its research profile was greatly elevated and new units including the Pulp and Paper Centre were established. John's research contributed to the department's heightened research profile. He made remarkable contributions to the understanding and modeling of gas-solid fluidized beds through his roles as an educator, a researcher and an innovator. John has been extremely successful in transferring his research accomplishments to practical, technical solutions to industrial processes and he holds a number of patents.

Throughout his career, John has published over 500 technical papers, book chapters and edited books, including Circulating Fluidized Beds in 1997. In 2001, John was awarded a prestigious Tier I Canada Research Chair in Clean Energy Processes, a tremendous acknowledgement of the importance and impact of his work. He held the Chair until his retirement.

John's contributions to engineering extended beyond our department as he served with organizations including the Canadian Society for Chemical Engineering, and the Canadian Engineering Accreditation Board.

John supervised or co-supervised more than one hundred masters, doctoral and post-doctoral fellows and nurtured them to become distinguished leaders. He lectured all over the world at universities, and industry sites. In recognition of his positive impact on students, John was awarded a Killam Mentorship Award at UBC. As Dean of Graduate Studies (1990-1996), he brought many positive changes to improve the quality of graduate education and the student experience. John put in the agenda of the Canadian Engineering Accreditation Board the matter of Safety in undergraduate programs.

CHBE Centennial Celebrations

The Chemical and Biological Engineering Department initiated its Centennial year with the installation of a distillation column display in the atrium. Fractional Distillation is a key unit operation of Chemical Engineering. Alumnae will recognize the display distillation column with fondness.

Distillation is used to separate two or more components in a mixture of liquids based on their differences in boiling points. The component that is most volatile (will vaporize more easily) is separated from the other components in the mixture. Industrially, distillation can be used to purify water to remove impurities. Another widely used distillation application is concentration of alcohol content in beverages. In the oil and gas industry, distillation is used to separate the hydrocarbons and acetone from acetic acid. Similarly, crude oil can also be separated into various useful products

The distillation column was built by the department of Chemical and Biological Engineering in the 1970's for experimental use in the Undergraduate lab course. The column was an integral experiment in lab courses until the early 2010's when the apparatus was replaced by an updated model. In November 2015, the distillation column display was rebuilt and installed in the CHBE atrium by the Workshop staff. The display includes a computer display of an animation of the distillation column process.

CHE Class of '65 Reunion

By Bill Potkins

10 of the 14 surviving members from the Chemical Engineering Class of 1965 met for our 50-year reunion on May 18, 2015.

Meanwhile 8 classmates managed to meet almost on time at the "new" Chemical and Biological Building. We were disappointed that "our" old building was no longer there. Still we all agreed that UBC campus must be the most beautiful in all of Canada. We were amazed at how much growth has taken place. The first place we checked out was the "classic" Chemistry building. We actually stepped into Room 300 our CHEM 300 classroom. We spent some time reminiscing before going on to the Engineering building from our past lives. Some remembrances that came up were where we took Calculus with Dean Gage, the "dunk" tank in the basement, the drafting class, the physics problem sessions, etc. Of course we all recalled the priceless Engineering stunt involving the placement and later destruction of "statue art" around the campus.

After having lunch at the White Spot (formerly the campus book store and bus stop coffee shop) we made our way back to the Chemical and Biological Bldg. Dr. Peter Englezos, the present head of the department, gave us a run through of the changes that have taken place in Chemical Engineering at UBC over the years. It was a real pleasure for us that Drs. Norman Epstein and Richard Branion joined us at this time. Next we were given a whirlwind tour and got glimpses of the amazing laboratories. In the hallways outside the labs there were posters that gave an idea of the various challenging studies that are ongoing. The present students are enjoying some exciting projects in a tremendous facility.

IN MEMORIAM

Helsa Leong

Helsa Wong Leong, passed away December 1, 2015 at the age of 56 years. Dr. Peter Englezos and faculty noted that Helsa, a member of the Department for 30 years was a pillar of our graduate programs, always going beyond her job description to support our students and faculty. She greeted newly arrived students with a smile, oriented them with patience and advocated for them through their study. For the past few years Helsa fought cancer back with amazing grace, optimism and courage. Helsa was always joyful and her generosity and dedication to the Department had remained intact. Such heroic approach to life and work is just unique and outstanding. Helsa was an inspiring person who you could trust. Helsa will be greatly missed by all of us in Chemical and Biological Engineering. Those who worked with Helsa will greatly miss her thoughtfulness and trust.

SEMINAR SERIES

Distinguished Speaker Series

The successful CHBE Distinguished Speaker Series attracts distinguished international speakers to come and provide presentation on their research. More information, bios and abstracts are available on our website, www.chbe.ubc.ca

March 19, 2015

DR. TRONG-ON DO
Full Professor, Chemical Engineering Department, Université Laval

Nanocomposites as sunlight-driven photocatalysts for H_2 generation from water splitting and for air depollution.

March 31, 2015

DR. NING YAN
Professor, Faculty of Forestry and Department of Chemical Engineering and Applied Chemistry, University of Toronto.

Bark Bio-refinery: Conversion of Bark Biomass Residues to Valued Added "Green" Chemical Products.

September 28, 2015

JEFF MORRIS
Department Chair and Professor, Grove School of Engineering, Department of Chemical Engineering, the City College of New York.

Extreme transitions of flow properties in mixtures: discontinuous shear thickening and hydrate jamming

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