

The

# EXCHANGER

Chemical and Biological Engineering Spring 2013

## Climate Change and the Role of Chemical Engineers

CHBE is helping to address the climate change  
challenges of the 21<sup>st</sup> century

## Complex Fluids Solve Real-World Problems

## Mine Remediation with Microbes



a place of mind

THE UNIVERSITY OF BRITISH COLUMBIA



# Message from the Head

I am pleased to share with you the second issue of *The Exchanger*, our department's newsletter, which provides highlights for the year 2012. This was again a year during which faculty and students received important awards in recognition of their excellent work and we warmly congratulate them. I want to take the opportunity to commend our graduate students for their initiative to establish the Professional Development Seminar Series. In these seminars, senior engineers from industry and academia reflect about their career and interact with our students.

During 2012, 60 students graduated with a BAsC degree in Chemical Engineering and 16 with a BAsC degree in Chemical and Biological Engineering. In addition, 20 students received their PhD, eight a MASc, one an MSc and seven their MEng degree. We congratulate these students and wish them well in their careers. The class of 1962 visited the department in May and share with us their experience of reuniting after 50 years. In 2012 we also welcomed Dr. Heather Trajano as Assistant Professor in our department. In her PhD thesis, Heather worked on the pretreatment of biomass to overcome plant recalcitrance.

The year was also marked by the tragic loss of one of our PhD students, Tyler Lewis, in a ski accident in December. Tyler was an excellent student who cared deeply about our world and wanted to make it a better place for the next generations.

British Columbia with its vast forest biomass resource, and high concentrations of clean energy activities, has a rare opportunity to lead the world in the production of bioenergy, biochemicals and bioproducts. Moreover, we have an ever increasing responsibility to lead efforts that enable Canada to improve its economic competitiveness and standard of living while at the same time sustaining the earth's global environment and biodiversity. This is then a truly exciting time to be in chemical and biological engineering because the grand challenges our society faces today require engineering solutions that will be based on our deep understanding of complex chemical and living systems. In this issue you have the opportunity to read about our research efforts to address carbon emissions and mitigate climate change.

We hope that you will enjoy reading *The Exchanger*. We look forward to hearing from you and we will be happy to see you visiting our department.

Peter Englezos  
Head



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If you are interested in becoming a mentor, reunion coordinator, volunteer at graduation, or another opportunity to stay connected, please contact the Alumni Relation Office.

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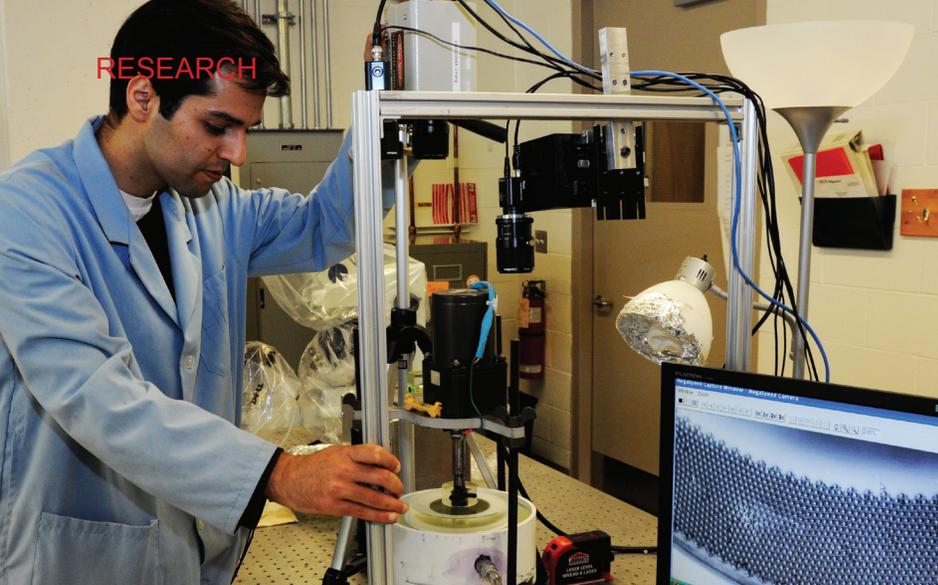
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On the cover:

The UBC Bioenergy Research & Demonstration Facility, first of its kind in the world of a community-scale heat and power system fuelled by biomass. Formally opened in the fall of 2012  
Photo by Don Erhardt



Hadi Mommadigoushki, PhD group member, carries out experiment in the laboratory of Professor James Feng

## Complex Fluids Solve Real-World Problems

Nitrogen bubbles of precisely controlled sizes are mixed into a surfactant solution to produce a “bubble raft”, or a two-dimensional foam. The behavior of these bubbles when the whole monolayer is sheared and transported may hold the key to a novel technology that can process oil sand efficiently and cleanly, with minimal impact on the environment.

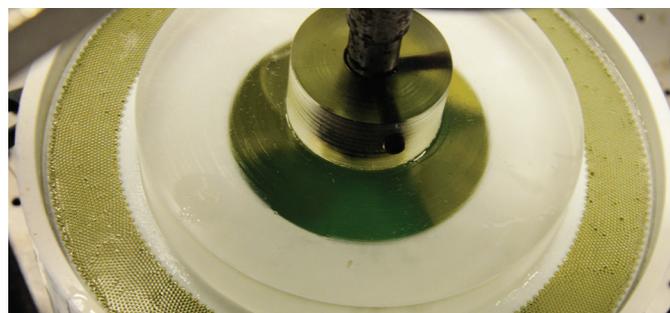
A Canada Research Chair in Complex Fluids and Interfaces, Professor Feng was trained as a fluid dynamicist and holds joint appointments between the departments of Chemical and Biological Engineering and of Mathematics. He is also a member of the Biomedical Engineering graduate program and co-directs the Complex Fluids Lab, an interdisciplinary research centre at UBC. He and his students have developed an interdisciplinary research program that ranges from the behavior of bubbles and foam in the petrochemical industry, to the mathematical modeling of malaria-infected red blood cells. The common denominator is “complex fluids”, fluids that have certain microscopic structures that endow them with unusual properties that can be harnessed for engineering and biomedical applications. The foam in the photo is a complex fluid, and how it flows depends on its “microstructure”, that is, the shape and arrangement of the bubbles. With Ph.D. student Hadi Mohammadigoushki, Professor Feng has studied how the bubbles may burst or coalesce during transport, and how bubbles of different sizes may spontaneously segregate into domains. This is being developed as a potentially ground-breaking technology for separating oil from water and other solvent.

Though sometimes viewed as a mathematician by his Chemical and Biological Engineering colleagues, Feng strives to integrate sophisticated mathematical and

computational tools with prominent real-world problems. Over the past three years, he led an NSERC strategic project on water removal in hydrogen fuel cells in collaboration with the National Research Council and industrial partners. His team of Ph.D. students and postdocs has developed a cutting-edge computing package that accurately tracks the interfacial motion and morphology during air-water flow through micro-pores and porous media. Taking advantage of a rigorous mathematical formulations and large-scale computer simulation, they not only demonstrated the shortcomings of current ad hoc design procedures, but also proposed a more rational and efficient design strategy that exploits the combined effects of substrate wetting gradients and external flow.

Another example of their interdisciplinary research is the study of the red blood cell after malaria infection. Healthy red cells are extremely flexible and easily traverse the tiniest capillaries. After the malaria parasite invades a red cell, however, it produces a series of biochemical modification of the cell membrane and cytoplasm, with the result of making the infected cell less deformable. Such cells will then occlude blood vessels and produce the life-threatening symptoms of malaria. Dr. Feng’s team carried out a comprehensive set of computer simulations of the process, and identified the growth of the parasite particle as a previously unrecognized factor in the pathogenesis of malaria. Currently, he is extending his expertise into the area of developmental biology to study how tissue growth and morphogenesis can be controlled in a clinical setting for wound-healing and organ regeneration.

For his work, Dr. Feng was recognized by a UBC Killam Faculty Research Fellowship (2010-2011) and an NSERC Discovery Accelerator Award (2009-2012). Aside from his research, he is passionate about teaching undergraduate students both in engineering and in mathematics, and about training graduate students into competent researchers. He is proud of his former students who have become outstanding scientists in academia and industry in Canada and abroad.



Right: Snapshot of Couette Shear Cell



## Mine Remediation with Microbes

We have been cautioned that a cougar was sited in the area, and that black bears frequently come by. Still it's good to be out among the grasses and trees early in the morning, and, at least, it is not raining today. As I stand on top of a flat area of grasses and look out over the Columbia River, I can see that Jim Hall and his crew have already set-up much earlier than my arrival. He has organized an ingenious system of hydraulic cables, electrical wires, a portable drill rig and water tanks. Even though the natural landscape belies it, we are standing on top of a biochemical reactor. Beneath us, water laden with toxic chemicals is flowing through a composting mixture of pulp mill waste. Further down the hill, this water ends up in a pond, with bulrushes, fish and the odd duck here and there. Beyond the pond, Al Mattes, the chief scientific officer of NatureWorks, is planting trees that he is irrigating with the cleaned-up water. He will use these for re-vegetating a section of sparse landscape across from the mineral processing plant.

The day progresses in spurts of frenetic grabbing, cutting, sealing, labelling, recording, desperate attempts to prevent wet mud from spewing forth, and idle waiting and watching Jim's crew drill the next core. Our efforts are rewarded with the excitement of what we are about to find in these foul smelling black sludges. Later, much later, back in the lab, our curiosity finally satisfied, we admire the hundreds of thousands of rows of four letter codes. With great excitement, and the ever increasing need for larger computer monitors, our passion for sorting, re-arranging, and calculating is put to good use in creating patterns of bright colours of every hue that tell the story of the complicated lives of the microbes in the chemical environment of the

biochemical reactor.

It is with much analysis that their story is woven into the continuum of the processes taking place to detoxify the water. There is not much to understand if nothing goes wrong. But, wrong it can go, and there are many consequences that we don't need to imagine. The aim of Dr. Sue Baldwin's research is to help mining companies clean up water that has been impacted by mining and mineral processing. These so called "mine-affected" waters are often contaminated with toxic compounds that, if released into the environment, would destroy aquatic life. To improve current active and passive treatment processes, and develop entirely novel methods, we are harnessing the metabolic diversity of microbes. Using recent advances in the new science of metagenomics, we can detect entire communities of microorganisms and their genes inside the biochemical reactors. Graduate and undergraduate students in Dr. Baldwin's lab are working on correlating these so called "big data" to the chemical environment of the biochemical reactor and the biochemical reactor's performance metrics. With this information, we make recommendations to the mining industry on how to improve treatment of mine-affected water. We are using the information garnered from our characterization of the chemical and biological mine environment to create new and better biochemical reactors in our lab at the University. This translates into new, pilot-scale biochemical reactors that are being tested at mine sites.

The overall motivation for our work is to help protect the natural environment, and to spawn next generation technologies for a more sustainable future for Canadians.

Left: Algae Ponds  
Right: Group member Maryam taking a sample



Class of 1962 visiting UBC

## Class of 1962

### Chemical Engineering Returns to UBC to Celebrate 50th Anniversary

By Colin Watson

"They still have the concrete block walls, but they've been painted." "Much brighter than before." "Look at all the space." "Everything's digital." "A very different world from our days in 'The Pit'." These strange comments came from a group of chemical engineers touring the chemical and biological engineering building on May 26, 2012, during the UBC Alumni Weekend. So let's put them in context.

Arising out of suggestions made four years earlier by several members of the 1962 Chemical Engineering class for a 50-year reunion, a small committee started making plans about a year before the event. The word went out—let's get together; bring red sweaters and slide rules (and any other paraphernalia from 50 years earlier), and classmates responded with enthusiasm.

Those red sweaters and slide rules were not the only features that distinguished us from today's department. The Class of 1962 was the first to complete its final year in the "new" chemical engineering building, having spent its third year in the chemistry building, where students used to congregate in a dark corner at the back of the building known as "The Pit". The move to our new chemical engineering building was a dramatic

change for us. But here we are 50 years later. The chemical engineering building as we knew it has been bulldozed and its bright new replacement is now called the chemical and biological engineering building.

To start our reunion weekend, 16 of the original 26 graduates gathered the evening of May 25 for a "Red Sweater Night", an informal get together for graduates and spouses that allowed us to once again get to know each other. This was important, as when many of us gathered at our hotel prior to the event, few, if any, could identify our former classmates, had they not been wearing those somewhat forlorn looking red sweaters. Conversation was stimulated by the informative and entertaining personal histories that each of us had prepared for circulation ahead of the weekend. We had strayed far afield over the years, with classmates coming from as far away as Athens, Greece, and London, England. However, as the evening progressed, and memories were jogged, we all began to reconnect with our common past. Perhaps even more interesting, we were surprised to find how often over that 50-year

*(Continued on page 15)*

## Dr. Heather Trajano

Dr. Heather Trajano is pleased that she was able to return to Canada to start her career in August 2012 as an Assistant Professor at the Department of Chemical and Biological Engineering. She earned her BSc in Chemical Engineering, Co-operative program from the University of Alberta, and her PhD in Chemical Engineering from the University of California Riverside. Dr. Trajano's passion is finding ways to enable fuel and chemical production from biomass in order to meet the growing demand for energy, reduce greenhouse gas emissions, and grow B.C.'s forestry industry. Biomass, such as forestry and agricultural residues, contain a wealth of building blocks for the production of renewable fuels and chemicals but recovering these

building blocks is challenging. It is also critical to find ways to integrate these new biorefining technologies with established pulping processes. Dr. Trajano's focus within this field is the kinetics and transport processes of the first production step, pretreatment, in order to develop efficient and cost effective strategies. Pretreatment is the lynch pin of the biorefinery; without a good pretreatment all other processes suffer. She is also interested in using metallic catalysts to upgrade biomass feedstocks to platform chemicals. Please feel free to drop by her office (CHBE 203) to say hello and have a chat.



## 35 Year Honorees

Since 2004 the University has been recognizing employees who have reached 35 years of active service at UBC. In 2012, two CHBE staff members were honoured by President Toope:

### Gordon Cheng

Shortly after graduating with his BAsC in Chemical Engineering in 1977, Gordon joined a research team in the department working on production of fuel and synthesis gas via coal gasification. He contributed to the construction, testing and operation of a large spouted bed gasifier. As a research engineer, he calibrated equipment, wrote computer codes for many of the calculations, ran experiments in the gasifier unit, and helped to analyse data and write reports. He is a co-author on numerous refereed engineering publications from this work over the period 1981-1995. Gordon could always find ways to solve experimental problems, and he helped advise students on bachelors thesis and masters projects based on his extensive experience. Gordon joined the CHBE worksop team in early 2000 as an Engineering

Tech 3. Since then, Gordon has showed a great passion for helping students in their designs and problem solving with chemical process. In 2010 Gordon was promoted to Engineering Tech 4 because of the extra responsibilities he had taken on himself. Gordon continues to be a valuable member of the technical team, hopefully for many more years to come.

### Helsa Leong

Helsa has been serving UBC with extraordinary commitment for the past 35 years. She has been serving the department as graduate secretary and is a key contributor to the success of our graduate program. She handles student affairs with tremendous efficiency and demonstrates an authentic interest and care for the students. Helsa greets newly arriving students with a smile, orients them with patience, and guides them to deal with a variety of issues they face.





Above: Artist rendering of the UBC Bioenergy Research & Demonstration Facility (BRDF)

## Climate Change and the Role of Chemical Engineers

Energy and Climate Change are topics of major global, national and local concern in the current century. Chemical engineers have a special role to play, as their training and expertise give them tools for addressing a number of the special issues and topics needed for the world to greatly reduce its reliance on fossil fuels, and to adopt measures which could have a significant impact on the release of greenhouse gases into the atmosphere.

Through its research partnerships with industry, teaching activities, and training of graduate students and other highly qualified personnel, the Department of Chemical and Biological Engineering is helping to address the climate change challenges of the 21<sup>st</sup> century. The following illustrates some of the recent and current activities in each of these spheres, demonstrating that the department, through its teaching, research, and service is committed to making a difference in clean energy.

### EDUCATION

The department played a major role in initiating (Grace) and delivering (Bi and Wilkinson) the successful new Master of Engineering program in Clean Energy Engineering. This interdisciplinary program provides training and cooperative education placements related to such topics as renewable energy, conservation, evaluation of engineering projects, and sustainable energy paths. The program receives financial support from BC Hydro Power Smart and from FortisBC.

Dr. David Wilkinson has been serving as Director of

UBC's Clean Energy Research Centre (CERC) since 2009.

The departmental Sustainability Club has organized various activities, such as production of biodiesel from food processing wastes, recycling of electronic waste, and organizing a Sustainability Fair.

A number of the department's undergraduate elective courses are directly related to energy (e.g. Thermodynamics, Heat and Mass Transfer, Chemical Reaction Engineering). In addition, the department offers undergraduate electives in Fuel Cell and Electrochemical Engineering, Petroleum Refining, Energy Engineering, and Green Engineering, as well as related courses in Air and Water Pollution Control.

### RESEARCH

Through the department and CERC, faculty members are actively pursuing research projects related to more sustainable energy technologies. This includes research on such topics as fuel cells, hydrogen generation and storage, solar energy, biomass conversion processes (both biological and



Right: BRDF biofuel. Locally sourced wood material in chip form  
Photo Credit: Don Erhardt

thermochemical), catalysis, carbon capture, life cycle analysis, carbon dioxide storage, NO<sub>x</sub> reduction and utilization of various waste materials. Sustainable energy research has become a major research area for faculty and students in the department.

The department is actively engaged in Carbon Management Canada (CMC), a National Centre of Excellence centered at the University of Calgary. Dr. John Grace is one of the network's four theme leaders, and a number of faculty members (Drs. Ellis, Wilkinson, Hatzikiriakos, Englezos, Lim, Grace) are involved in research CMC-sponsored projects.

#### INDUSTRY PARTNERSHIPS

Germany's Fraunhofer Society formed a \$4.9M partnership with UBC for research related to clean energy. Three of the four UBC projects undertaken under this partnership are being led by CHBE faculty members (Drs. Bi, Grace and Wilkinson.)

Drs. Sokhansanj, Bi, Lau and Lim are actively engaged, together with industry and faculty members from the Faculty of Forestry, in research on wood pellets and preparation of woody biomass for energy processes through the Biomass and Bioenergy Research Group (BBRG). The Wood Pellet Association of Canada, representing more than four companies producing and serving pellet production (pellet producers, equipment manufacturers, shipping companies, testing laboratories) is collaborating in this work. Specific companies are Alltentech, Delta Research Corp., Di Carbon, GreenLeaf, GreenScene, H2E Power, LGI, Nexterra, Pacific Bio, Pinnacle Renewable Energy, Premium Pellet, Princeton Cogen, Western Forest Products, and Weyerhaeuser.

Department researchers are also working actively with a number of other companies on energy-related projects. These include: ABRI-Tech Inc., Alstom Power, Automotive Fuel Cell Cooperation (AFCC), Ballard, Carbon Engineering, Chemetics, Daimler Benz, Diacarbon, EVT Power, Highbury Biofuel Technologies, Hybrid Energy Technologies (HET), Johnson Matthey, National Research Council (NRC IFCI), Noram Engineering, Syncrude Canada, Trojan, and ZincNyx.

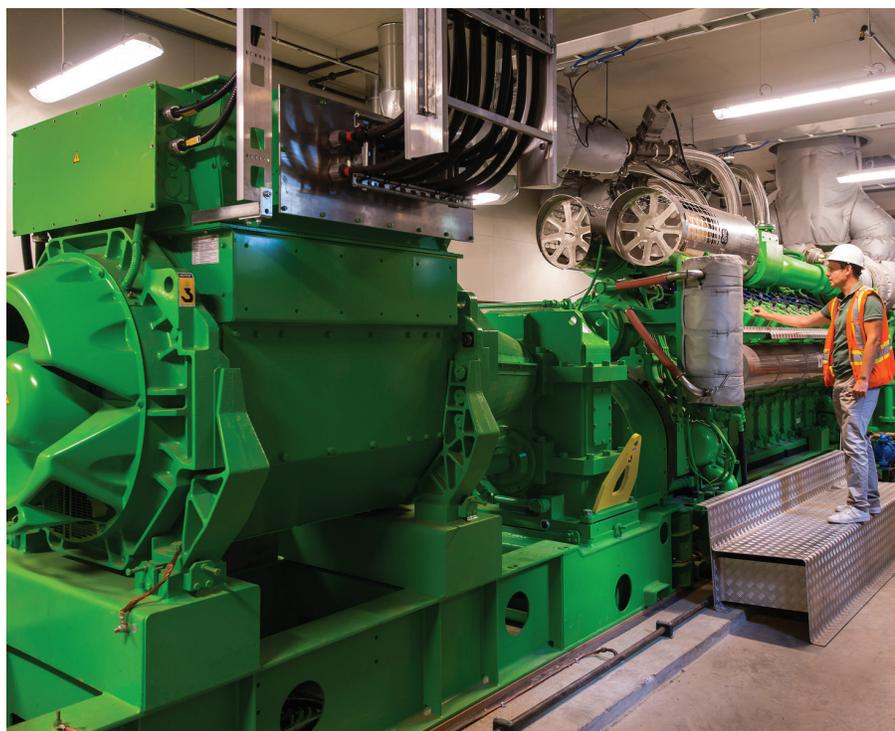
#### UBC LIVING LABORATORY

Department members have been instrumental in bringing a 2 MW<sub>e</sub> biomass gasifier to UBC. In addition to replacing obsolete fossil-fuel-burning technology with more sustainable energy, this

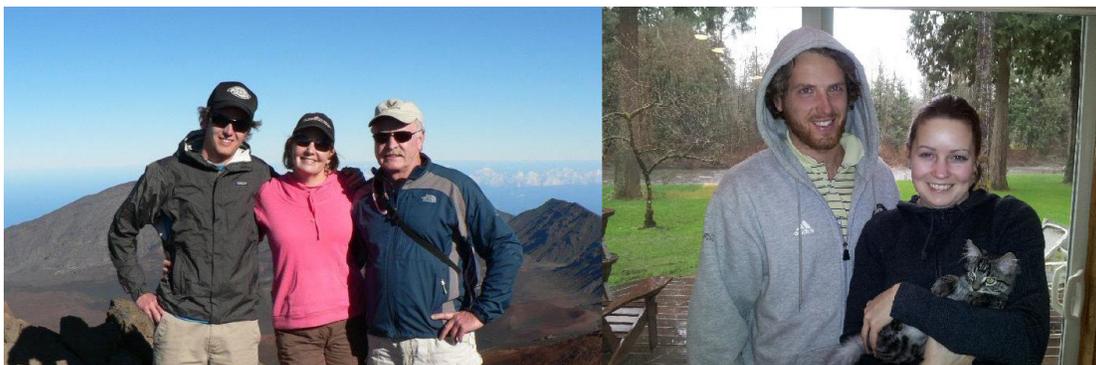
gasifier is demonstrating new technology developed by a local company, Nexterra Systems Corporation, for electricity generation from woodwastes. It is also the initial major project in the UBC Bioenergy Research and Demonstration Facility (BRDF), the first component of "Living Laboratory" projects which demonstrate solutions to local and societal challenges based on UBC resources and facilities. This gasifier is turning waste building material into steam, heat and power for the University, helping to make the campus more sustainable, and providing opportunities for both demonstration of locally-based technology and for industry-relevant student research. There is good synergy also with biomass gasification research underway in a dual-fluidized bed gasification facility nearing completion in the Pulp and Paper Centre lead by Professors Bi, Ellis, Grace, Lim and Watkinson.

Many students, undergraduate as well as graduate, are keenly interested in participating in projects and activities in clean and renewable energy. Through their research, extracurricular activities and studies, they are preparing to make a real difference in achieving a more sustainable energy future for our society.

Below: BRDF GE Jenbacher Engine that generates electric energy.  
Photo Credit: Don Erhardt



## Tyler Graham Prindle Lewis August 13 1986 - December 9 2012



It is with heavy hearts we announce the passing of Tyler Lewis. He is deeply missed by his parents Graham and Lynn, and by his cherished love Dawn-Marie. He leaves behind his Grandfather Garth Prindle, Nana Sue Cawston, Aunts, Uncles, and Cousins, and the Barreira Family. He is also missed by his closest friends Carl, Emily, Eric, James, Michael, Mike, Ryan, Saad, Sean, and Tom, and by the multitude of friends he had made over his amazing life.

Tyler grew up in Maple Ridge where he attended Yennadon Elementary School and Maple Ridge Secondary School. Tyler attended Mercer University in Georgia on a soccer scholarship. He completed his undergraduate education at Queen's University, graduating in the Engineering Chemistry program with first class honors. Throughout his time at Queen's, Tyler was a starting goalkeeper on the men's varsity soccer team and actively involved in the intermural league, and it is also where Tyler met his girlfriend Dawn-Marie. Following graduation, Tyler returned to his west coast roots, attending UBC where he worked on his Masters degree for a year before transferring to a PhD program in Chemical Engineering. Tyler was passionate about environmental causes and under the supervision of Drs. Ellis, Grace, and Bi, he dedicated his doctoral work to sustainable technology. Tyler was a member of the Sustainability Club and he also mentored several undergraduate students. Tyler's passions included skiing, surfing, cycling, rock climbing, and hiking. Tyler devoted his time to several philanthropic endeavors including the Ride to Conquer Cancer, which he completed last spring and was planning to participate in again in 2013. Tyler was an avid traveler and adventurer, both abroad and locally. He and Dawn-Marie enjoyed spending summers at Harrison Lake with family and friends. Tyler's musical talents included the guitar, saxophone, and piano. Tyler was an extraordinary man; caring, compassionate, loyal and dedicated. He was a wonderful son, friend, and co-worker with a great sense of humor who left a profound impact on everyone who had the pleasure of knowing him. The Lewis and Barreira families want to extend their gratitude to the North Shore Search and Rescue, VGH ICU and all those who were involved in the heroic attempt to save Tyler's life. The family thanks those who have opened their hearts and provided their condolences and support. To find out how you can help, please visit the Tyler Lewis Clean Energy Research Foundation: [www.tylerlewis.ca](http://www.tylerlewis.ca).

## Thomas Bennett Student Enrichment Memorial Awards in Chemical and Biological Engineering

On February 1st, 2012, undergraduate students Matthew Reeve (CHBE, Process Option, '12) and Michael Peters (CHBE, Bio-Process Option, '14) were the inaugural recipients of the Thomas Bennett Student Enrichment Memorial Awards in Chemical and Biological Engineering. Thomas Bennett graduated with a Bachelor of Applied Science in Chemical Engineering and Honours in Chemistry from UBC in 2007. On April 1st, 2010, Thomas passed away in a tragic mountain climbing accident at the age of 26 on Mount Shasta in Northern California. Tom was passionate about climbing and sustainability. It was an expression of his mantra to live life to its fullest. The award was set up by Tom's family and friends to support student enrichment activities, specifically, students who demonstrate high academic achievement, leadership, and social and environmental concern. In December 2012, the award was approved by the UBC Senate to become an official UBC award.



M. Reeve, Mary Kenny (Tom's mother) and M. Peters

## CHBE Biodiesel Project

The Biodiesel Project is a movement to reduce campus emissions and lower UBC's ecological footprint by turning a portion of the campus' waste fryer oil into biodiesel fuel to power campus vehicles. Five years ago, a few motivated students under the guidance of Dr. Naoko Ellis, constructed a pilot scale biodiesel production plant in the department. In the winter of 2012 the CHBE Sustainability Club re-commissioned this plant and began producing biodiesel. With a willing partner in UBC Housing and Hospitality Services, the club has sold nearly 500 liters of biodiesel / petro-diesel blended fuel (B20). The fuel is produced by teams of undergraduate students who are given the rare opportunity to get hands on experience with a real world chemical process. More than 20 undergraduate and half a dozen graduate students have been involved in the project. More recently, the production of soap from waste glycerol has been undertaken in an effort to make the production process waste free. The addition of new blend on demand fueling station and ion exchange column will hopefully lead to more UBC partners and fuel sales going forward.



The CHBE Sustainability Club is made up of graduate and undergraduate students from the Chemical and Biological Engineering Department interested in helping the departmental and campus communities operate in a more sustainable manner. Its goal is to promote and encourage the CHBE and UBC communities to consider the social, economic and environmental impact of day-to-day decisions, and the sustainable influence they have on the world. The club was started in 2006 with the hope to promote sustainable initiatives, and since then has been a model for sustainable culture for the department and campus through events and projects.

If you would like to learn more about the Biodiesel Project or other events and initiatives, visit our website at: [www.ubcbiodiesel.com](http://www.ubcbiodiesel.com)

The Biodiesel Project team, including Dr. Naoko Ellis

## Graduate Students

The Graduate Student Club (GSC) is an elected student organization that acts as a liaison between students, administration, and faculty of the Chemical and Biological Engineering Department.

Student activities are as diverse as the students who organize them. GSC covers an array of interests and hobbies from social, international, departmental, religious, or performing arts clubs. GSC focuses on academic and social activities to assist students in developing skills, improve social activities via different programs, and strengthen students' networks.

### Social & Sports Events

The GSC volleyball team, HAWKS, are currently competing in the league and are trying to defend their championship title. The GSC is going to yet again organize intradepartmental foosball/Ping-Pong tournaments over the summer in order to give the CHBE graduate students an opportunity of light exercise as well as having fun with their fellow friends. The champion is awarded a trophy each year.

### Academic Events

*Professional Development Seminar Series*

The GSC hosts Professional Development Seminars Series to give students opportunities to learn directly from experiences of successful academic or industry experts. The goal of the series is to disseminate important tips and information among graduate students on how to build a successful career in academia or industry, and create networking opportunities for students.

*Graduate students Research Day*

The GSC will be holding a Research Day in the department in the fall of 2013. The main purpose of this event is to be inspired by the achievements of our graduate students. Students will present their research achievements in both oral and poster format. This event will give students an opportunity to share resources and exchange their ideas, and is also a great place for students to interact and exchange information with representatives from various invited companies.



CHBE graduate students and faculty at the 2012 holiday party



Students on the annual third-year field trip.

## Third-Year Student Field Trip

The annual third-year chemical and biological engineering field trip sponsored by Shell took place from October 29<sup>th</sup> to November 3<sup>rd</sup> of 2012. The trip was highly effective in showcasing major Canadian industries and operations involving chemical and biological engineering.

Students enrolled in the chemical and biological engineering program visited Fraser Valley Biogas and AlgeaCan research facilities on the first day of the field trip. Due to the recent development of various new bioprocess operations, these tours were extremely effective in familiarizing the students with new industries in the field. Students in the chemical engineering program attended a tour at Lafarge to observe the full-scale production of the cement, concrete and aggregate. All students in the third-year program took advantage of tours at Kamloops center for water quality, ALS G&T Metallurgical labs, Shell and Agrium.

A full day with the staff at Shell headquarters in Calgary familiarized the students with the operations and various opportunities at the organization. Shell did a fantastic job at hosting and grasping the attention of students. The speakers at the labs in the CRC were extremely

informative and knowledgeable in their field of research. Passion about their job and field was extremely apparent when the employees would speak about their department. This inspired students to listen closely, ask questions and become far more curious about the processes and the company as a whole.

The dinner hosted by Shell was very well put together and did a great job in serving as a networking session for the students and Shell staff. The keynote speakers had a great deal of experience and knowledge to share with the group and had very interesting speeches. The question and answer portion of the evening were also extremely valuable to the students who took advantage of the opportunity.

On behalf of the third-year class, we would like to thank Shell and all of the hosts for this spectacular opportunity to tour various sites, network with employees, and gain more knowledge about the industry and opportunities available to us during our education and beyond. This has truly been a rewarding experience and has undoubtedly sparked curiosity, ambition, and drive in the students in the Department of Chemical and Biological Engineering.



David Bruce and Maziar Derakhshandeh at the Com-Mu-Nity show.

## Grad Arts Club - Art Show

The CHBE Grad Arts Club was founded 3 years ago as a venue for artistic expression and the continued practice of fine arts skills by the members of our graduate community. Activities such as painting, photography, life drawing, and sculpture also allowed for shared teaching experiences among club members as the students learned new techniques from one another. These hands-on skills, although seemingly unrelated to the academic subjects of their daily lives, often aided in their scholastic research practices. By continuing to develop new skills and expand their

breadth of knowledge it is hoped that these shared experiences promote continued neuroplasticity as they grow, and further develop a well-rounded, social student body.

Mid-October saw the presentation of the CHBE Graduate Student Art Club exposition, 'Com-Mu-Nity'. The show was focused on the reflection of perspectives of the CHBE community and expressed views about who we are, where we work, and the people who share our lives with us.

# Congratulations on a year of success

## Shell Canada Prize

Shell Canada has established prizes for the top fourth-year chemical and biological engineering design projects. The prize is designed to recognize students' activities and learning in their capstone design course. For the 2011-2012 academic year, the Shell Prize was awarded to the following student team:

"Production of carbonated liquid yogurt"

Group:

Yaxi Wendy Cheng  
Kelsey Leigh Gerbrandt  
Yvonne Hsieh  
Heather Ruth Kempthorne  
Paul Minski Kim  
Cherie Tan



## Hydrate Conference Award

The 6<sup>th</sup> international conference on gas hydrate (ICGH) endowed a fund to the department in support of the fourth year capstone design course. The 2011-2012 winning projects are:

"Biomass gasification power plant for Smithers, BC" Team:

Nor Asma Ibrahim  
Basher Salah Jazrawi  
Sophia Jin  
Curtis Kerr  
Jun Sian Lee  
Elizabeth McKeown

"Production of styrene monomer via dehydrogenation of ethylbenzene" Team:

Zaid Al-Jawadi  
Ammar Bakhurji  
Mollie Boon Lee Khoo  
Jing Hang Kwok  
Pui Man Leong  
Boon Ping Ng



## Killam Graduate Teaching Assistant Award

Congratulations to PhD candidate James Butler for being awarded the the 2011/12 UBC Killam Graduate TA Award. The award recognizes a small number of graduate students at UBC for their outstanding contribution to teaching and learning. We are grateful for James' contribution to our department.

## John R. Grace Graduate Scholarship

James Butler and Nagu Daraboina, PhD candidates, were awarded the John R. Grace Graduate Scholarship in Chemical and Biological Engineering. This scholarship has been endowed in honour of Dr. John R. Grace by his wife, Dr. Sherrill E. Grace, for graduate students in chemical and biological engineering who demonstrate academic excellence and potential for service to society by performing research on energy, the environment, and/or multi-phase systems. The award is made on the recommendation

of the Department of Chemical and Biological Engineering in consultation with the Faculty of Graduate Studies.



## Community Service Learning Award

Four 4<sup>th</sup>-year students, Heather Kempthorne '12, Wendy Cheng '12, Cherie Tan '12 and Anastasia Gumelia '12, won the E-Fest 2012 Community Service Learning (CSL) Award for their outstanding contributions to community development while undertaking their fourth year problem based laboratory. The project relates to the development of a method to monitor carbon sequestration by eelgrass (photo). The Comox Project Watershed hopes to use carbon offset credits to plant more eelgrass into the Comox Estuary.



## Carbon Management Canada (CMC) - poster competition

PhD candidate Nagu Daraboina won the poster competition at the second annual conference hosted by Carbon Management

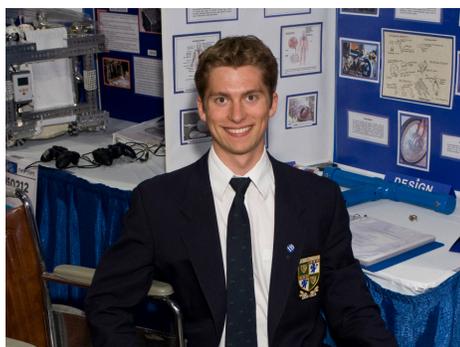
## STUDENT ACHIEVEMENTS

Canada (CMC) in Gatineau, Quebec from May 23-25, 2012. His winning poster is titled "Secure Storage of Impure Co<sub>2</sub> in the Form of Solid Hydrate in Depleted Pools in Northern Alberta", with contribution from the Thermodynamic Group at UBC supervised by Dr. Peter Englezos.



### Honeywell - UniSim Design Challenge

Bryan Gene (CHBE '12) is the winner of the 2012 UniSim Design Challenge, an annual University student competition held in conjunction with the Honeywell Users Group (HUG) Americas Symposium. The UniSim Design Challenge is one of several Honeywell Process Solutions (HPS) initiatives designed to encourage engineering studies.



### Young and socially aware

Congratulations to CHBE student Michael Peters for winning Youth in Motion's 2012 Top 20 Under 20™ Award. The award is given each year to 20 Canadians under the age of 20, who through leadership and innovation contribute to improving their school, community, province and country. Peters has devoted much of his time to creating a technology to individuals contending with mobility challenges. In high school, he developed a device, "the Actuator", to attach to the front of a

wheelchair, enabling its user to benefit from improved mobility and blood circulation. As a winner of Top 20 Under 20™ Award, Peters will be paired with an industry mentor of his choosing and hopes the mentorship opportunity will enable him to further develop his prototype.

### 2012 Rio Tinto Alcan Research Fellowship

PhD candidate Amir Mehdi Dehkhoda won the 2012 Rio Tinto Alcan fellowship. This fellowship is intended for a graduate student in a field of pure or applied science related to Rio Tinto Alcan's activities. Dehkhoda's proposed research topic is investigation of a renewable carbon-based electrode material in electro-sorption of unwanted ions within industrial effluents. This project was categorized under "Environment" research area of Rio Tinto Alcan as a potential purification method in aluminum production waste minimization.



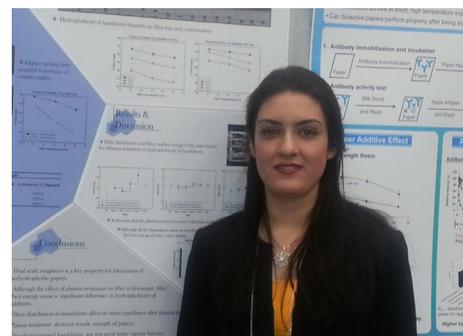
### Young Scientist Award - International Congress on Catalysis

Dr. Farnaz Sotoodeh, postdoctoral fellow in Professor Kevin J. Smith's group, won a "Young Scientist Award" at the 15<sup>th</sup> International Congress on Catalysis (ICC), held in Munich, Germany on July 1-6<sup>th</sup>, 2012. The ICC is held every four years and provides a high-profile scientific opportunity for discussion and exchange of new ideas in the field of catalysis from around the world. Catalysis is one of the key leading technologies in the synthesis of energy carriers and chemicals. The "Young Scientist Award" is awarded by the International Association of Catalysis Societies (IACS) to the most promising young scientists (under age 35) in recognition of their excellent scientific contributions in the field of catalysis.

Dr. Sotoodeh, who received her PhD degree in Chemical Engineering in the CHBE Catalysis group supervised by Professor Kevin J. Smith, presented her work describing a heterogeneous catalytic system for fast and efficient release of hydrogen from organic liquids for hydrogen-fuel utilizing systems. She used the density functional theory (DFT) technique to study the dehydrogenation reaction mechanism. Her research will contribute to the use of hydrogen as an alternative fuel for vehicular applications and to the development of the hydrogen economy.

### Plant Design UG Award

Congratulations to the UBC undergraduate team that has been awarded a 2<sup>nd</sup> place in the Plant Design project competition at the 62<sup>nd</sup> annual Canadian Chemical Engineering Conference. The award was presented on October 15, 2012 at the student banquet. Congratulations to Cherie Tan, Paul Kim, Heather Kempthorne, Yvonee Hsieh, Kesly Gerbrandt, and Wendy Cheng.



### Graduate Student Poster Awards

Congratulations to Mehr Negar Mirvakili, supervised by Dr. Englezos and Dr. G. Hatzikiriakos, for winning 1<sup>st</sup> place award in the Graduate Student Poster competition during the 62<sup>nd</sup> CSCHE Conference in October 2012. The title of the poster was "Superhydrophobic fiber network loaded with functionalized fillers".

Congratulations to Reza Rezaei, PhD student, for winning the 2<sup>nd</sup> best poster at the 15<sup>th</sup> National Conference on Drinking Water held in Kelowna in October 2012.



#### **2012 Canadian Catalysis Lectureship Award (CCLA)**

Dr. Kevin J. Smith was awarded the Canadian Catalysis Lectureship Award for 2012 by the Catalysis Division of the Chemical Institute of Canada. The award is sponsored by the Canadian Catalysis Foundation (CCF) and provides funding for Dr. Smith to present his research at selected locations across Canada.

#### **2012 Montreal Medal**

Professor John R. Grace received the 2012 Montreal Medal, a Chemical Institute of Canada award, during the 2012 CSChE conference October 14-17, Vancouver BC. Dr. Grace gave a plenary lecture entitled "Reflections on the Role and Future of Chemical Engineering" at the conference.

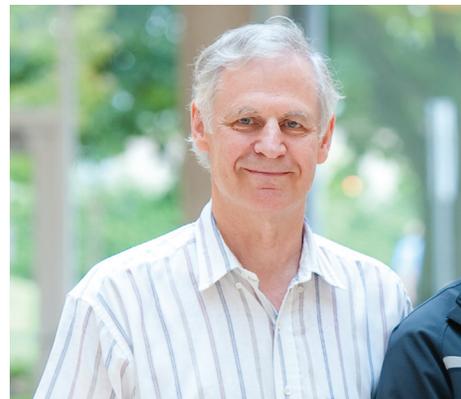


#### **PSRI Lectureship Award in Fluidization**

Dr. Xiaotao Bi received the PSRI Lectureship Award in Fluidization during the 2012 AIChE Annual Meeting in Pittsburgh, Oct. 28 – Nov. 1, 2012. This award recognizes an individual's outstanding scientific/technical research contributions with impact in the field of fluidization and fluid-particle flow systems. The award was presented to Dr. Bi for his outstanding contributions in delineating fluidization flow regimes, understanding electrostatics, investigating turbulent fluidization, defining choking, clarifying flooding and assisting with signal interpretation.

#### **UBC and Fraunhofer Society**

A \$4.9-million research partnership between the University of British Columbia and Germany's Fraunhofer Society – Europe's largest applied research institution – will advance clean energy research in five critical areas, from wind energy to zero emission vehicles. Congratulations to the whole team of senior engineering professors, 3 of which are from CHBE - Dr. David Wilkinson, Dr. John R. Grace and Dr. Xiaotao Bi.



#### **DuPont Particle Technology Forum Award**

Congratulations to Dr. John R. Grace who received the DuPont Particle Technology Forum Award during the 2012 AIChE Annual Meeting in Pittsburgh, Oct. 28 – Nov. 1, 2012. This award recognizes a forum member's lifetime outstanding scientific/technical contributions to the field of particle technology, as well as leadership in promoting scholarship, research, development, or education in this field. The 2012 award was presented to John R. Grace for his outstanding contribution in research and education in chemical engineering and for being one of the leading researchers in fluidization and multiphase systems.

*(Continued from page 6)*

period our paths had almost, but not quite, crossed.

The morning of May 26 found us gathering at the chemical and biological engineering building. Our day began with an introductory talk by Dr. Peter Englezos, that described very well the current department and, perhaps most importantly for us, how "Biological" entered the department's name. He tolerated our somewhat rowdy behaviour (we weren't beholden to our professors for passing grades any more) and he patiently responded to our numerous questions. Then he and Dr. Jim Lim took the group on a tour of the building. We were very impressed and that prompted many of the comments mentioned at the outset.

Following our tour, we gathered for lunch and were joined by one of our former professors, Dr. Norman Epstein, who had supervised several of our graduating theses. More stories were exchanged with Dr. Epstein, who once again demonstrated his sharp mind and keen interest in his former students.

We had a free afternoon to capitalize on the numerous events and tours offered by the University for Alumni Weekend. This was capped by dinner at Bridges Restaurant, offering out-of-towners a chance to experience the Granville Island lifestyle.

During an impromptu breakfast the following morning involving those grads staying at the Delta Airport Hotel we came to the unanimous conclusion that the reunion had been an overwhelming success, thanks in no small part to the assistance offered by the department itself and by Alumni Relations Coordinator, Courtney Smith.

## 62<sup>nd</sup> Canadian Society of Chemical Engineering Conference was a great success

The 62<sup>nd</sup> Canadian Chemical Engineering Conference was held from October 14-17, 2012 in the Hyatt Hotel, Vancouver, BC. Over 1000 delegates from around the world attended this conference with a central theme of "Energy, Environment and Sustainability".

Philippe Tanguy from TOTAL delivered the opening plenary on the global energy demand and supply, and the importance of energy efficiency, conservations and alternative energy sources. Kathryn Harrison of UBC gave the second plenary talk on Canada's policies on climate change and sustainability. Following her talk, a panel discussion on sustainability was facilitated by Roland Clift of the University of Surrey, and CHBE Adjunct Professor, and a panel of experts from local industry and overseas. On the 3<sup>rd</sup> day, the Montreal Medal recipient, Dr. John R. Grace of UBC, gave a personal reflection of the challenges and future roles of chemical engineers in Canada, while Michael Sefton of the University of Toronto shared his >25 years research and innovation on tissue engineering.

771 papers were presented in 22 parallel sessions each day, the highest number for a national CSChE conference. The subject

ranged from biomass/bioenergy to carbon capture and storage, fuel cells, sustainability, particle technology, water purification, stem cells and catalysis. The conference consisted of five international symposia, including the 3<sup>rd</sup> International Symposium on Gasification and its Applications (ISGA-3) which attracted more than 100 papers. The conference also attracted over 220 international participants, mostly from Asia.

The local organizing committee consisted of Maja Veljkovic (chair, NRC), Xiaotao Bi (co-chair, UBC), Madjid Mohseni (program chair, UBC) and Tony Boyd (program co-chair, Noram Engineering). Many faculty members, graduate and undergraduate students were also closely involved in organizing various symposia, themes and technical sessions, and assisting the registration and technical sessions. The conference was a great success. Part of the surplus revenue from this conference will be used to support the CHBE Sustainability Club and to endow a CHBE student conference travel grant to encourage student participation in future CSChE meetings and other conferences.

## Speaker Series

We had an active Speaker Series schedule in 2012, hosting a number of world-class researchers. You are welcome to visit our website to view bio's and abstracts, as well as upcoming events.

More: [www.chbe.ubc.ca/news-events/speakerseries](http://www.chbe.ubc.ca/news-events/speakerseries)

October 4, 2012	June 4, 2012
Dr. Theodore (Ted) J. Heindel, Bergles Professor of Thermal Science from Iowa State University "Using X-Rays to Visualize Multiphase Flows"	Dr. Nicolas Kalogerakis from the Technical University of Crete, Greece "Bioremediation Strategies to Combat Marine Oil-Spills"
March 29, 2012	March 22, 2012
Dr. Richard Braatz, Professor of Chemical Engineering, Massachusetts Institute of Technology (MIT) "Advances in Pharmaceutical Crystallization: Control of Polymorphic Identity, Shape, and Size Distribution"	Professor Ajay K. Dalai, Professor and Associate Dean, Research and Partnerships at the University of Saskatchewan "Development of Novel Carbon Nanotubes Supported Catalysts for Fischer-Tropsch and Higher Alcohol Syntheses"
February 29, 2012	January 19, 2012
Dr. George Karniadakis, Professor of Applied Mathematics, Brown University. Also Research Scientist of Mechanical Engineering, MIT "Multiscale Modeling of Physical and Biological Systems"	Dr. Alejandro D. Rey, James McGill Professor, McGill Materials Modelling Research Group, Department of Chemical Engineering, McGill University "Modeling Liquid Crystal Materials and Processes in Biological Systems"