

Pulp Digest

Q1 and Q2, 2018

January to June



Our jubilant team of presenters at the PACWest Conference in Jasper on June 1. (Left to right) Prof. Nuwan Sella Kapu, UBC Session Chair, Jingqian, MehrNegar, Ehsan, Taraneh and Reza.

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PPC Events

Two quarters have gone by so fast at PPC this year with more events added to our calendar, more deliverables to process, and happily, more people to network with. We've sent our students to represent UBC at events, and we've hosted international visitors at our Pulp and Paper Centre (PPC). We're pleased to record these events in this edition of Pulp Digest covering Q1 and Q2 of 2018 from January to June.

UBC at PACWest 2018, May 30 to June 2 (Cover Story)

UBC's presence at the PACWest conference in Jasper was stronger than ever with women engineering grads outnumbering their male peers at the dedicated session, *Students: Our Future*. Prof. Nuwan Sella Kapu chaired the session on the Friday of June 1. Our participants are featured below.

Jingqian Chen, University of British Columbia

"Optimization and modelling of hemicellulose oligomers production from pulp mill residues for use as pulp strength additives"

Jingqian Chen, obtained Master's degree in Chemical Engineering from the University of Michigan on biodiesel production from microalgae. Afterwards, she worked as research scientist at LP Amina, Inc. on coal to chemical technology. Currently, she is a PhD candidate supervised by Dr. Trajano and Dr. Beatson in Chemical and Biological Engineering department at UBC. Her research focus is softwood hemicellulose extraction, hydrolysis kinetic modelling and the hemicellulose application in pulp as strength additive.

Reza Harirfaroush, University of Victoria

"The effect of recirculation mode on bar forces in low consistency refining"

Reza is a Postdoctoral Fellow in the department of Mechanical Engineering at the University of Victoria. He collaborates with UBC in the "Energy Reduction in Mechanical Pulping" research (ERMP) program, which aims to develop refiner control strategies based on in situ signals from the refiner force sensors to reduce electrical energy consumption in mechanical pulping. Reza investigated the indications of the onset of fibre cutting using custom-built piezoelectric force sensors. He also studied the effect of pulp furnish and plate pattern on bar forces in low consistency refining

Taraneh Kordi, University of Toronto

"Discrete element modelling of plybond strength of multi-ply paperboards"

Taraneh is nearing completion of her Master of Applied Science in the department of Chemical Engineering and Applied Chemistry at the University of Toronto. She works under the supervision of Prof. Ramin Farnood and is part of the ERMP group at UBC since May 2016. Taraneh 's thesis focuses on the application of low consistency refining in producing multi-ply boards, and she works on modelling plybond strength of paperboards. The modelling research project was conducted in collaboration with Prof. Uesaka 's group at Mid Sweden University, Sweden.

Mehr Negar Mirvakili, University of British Columbia

"Enhancing barrier performance of lignocellulosic papers"

PPC Events

Negar's PhD thesis entitled "Surface Engineering of Wood Fiber and Filler Networks" covers different techniques to enhance the barrier performance of cellulosic paper. Her research interests include design and fabrication of cellulose based functional materials for biomedical application, lab on chip diagnostics, sensors, and energy storage devices.

Hui Tian, University of British Columbia

"Moving horizon estimator design for mechanical pulping process"

Hui is working on designing model predictive controllers for the refining process in mechanical pulping industry. A central goal of her PhD research is to use novel economic and distributed model predictive control and optimization strategies to reduce energy consumption in multistage high consistency and low consistency refining.

Ehsan Zaman, University of British Columbia

"A numerical study on developing a hydrocyclon-specific turbulence model"

Ehsan is nearing completion of his PhD at UBC's Mechanical Engineering department. His main research area is computational fluid dynamics (CFD) in hydrocyclones. Other research areas of interest to him are turbulence and multiphase flows. Additionally, he is studying the effect of design parameters—including cone angle—on the hydrocyclone flow hydrodynamics.

UBC has supported the PACWest Conference for the past few years by chairing the Students' Session, and by opening doors of research interest to industry. The PACWest conferences are very ably administered by a group of volunteers who hold full-time senior positions in the pulp and paper industry. These volunteers create a packed schedule of industry speakers and the conference hosts special events by invitation — the dinner gala, a golf competition, a presenter's breakfast, the keynote speaker luncheon. Spouses and accompanying guests have special interest programs organized for their entertainment such as yoga and spa sessions, canoeing on the lake, nature walks, and introduction to local flora. The Fairmont Group of hotels has been the venue of choice.



Jingqian, Chitra (PPC staff), Ehsan, Negar, Taraneh and Reza at the awards ceremony on the evening of June 1.



The PACWest conference concluded officially with a gala dinner and dance event where prizes were awarded and contributors recognized.

PPC Events

UN-UBC partnerships

A UN team for industrial development, and paper specialists from the Central Pulp and Paper Research Institute (CPPRI), India visited us at PPC in the first week of February. The team came on a fact-finding mission to establish a knowledge-sharing link to use biomass and re-engineer industrial bio-wastes from pulp mills to novel products. Their two-day schedule was packed with meetings. Faculty from Forestry and Applied Sciences generously contributed their time to share their research with the UN team; we extend our thanks to Profs. Xiaotao Bi, Jack Saddler, Scott Renneckar, Richard Chandra, Shawn Mansfield, Harry Brumer, Lindsay Eltis, Robert Kozak, and Mark Martinez.

Industry leaders, Dr. Ira Wolff and Doug Taylor of Noram Engineering, Dr. Cladio Arato of S2G BioChem, and Tim Caldecott of FPIInnovations gave personalized tours of their establishments to show research put to commercial realities and practical applications.

The UN team comprised Drs. Rajeev Vijh and Rakesh Kumar Jain from UNIDO and Drs. Ashwani Dixit and Ravi Datt from CPPRI. They followed their visit by signing a Memorandum of Understanding with UBC.



The UN team enjoyed the ambience of UBC's Rose Garden, even in the chill of early February.



Left to right: Drs. Ravi Datt, Ashwini Dixit, Rakesh Jain and director, Rajeev Vijh.



The UN team took a good look at PPC's labs.



The UN team met with Tim Caldecott at FPIInnovations.

Introduction to Pulp and Paper Technology Course

This course, offered annually in Spring by the Advanced Papermaking Initiative (API) at UBC's Pulp and Paper Centre continues strong into its 18th year. Faculty from the departments of Chemical and Biological Engineering, Forestry, and Mechanical Engineering volunteer to deliver lectures each year we've run this introductory-level course.

James A. Olson - Dean, Faculty of Applied Science
Peter Englezos - Head, Dept. of Chemical Engineering
Rodger Beatson - Adjunct Professor, Faculty of Forestry
Robert Gooding - Faculty Associate, PPC
Nuwan S. Kapu - Asst. Director of MEL program, and
Mark Martinez - Director, PPC.

The course comprises theory as well as laboratory work for registrants in small groups, which accounts for us choosing to cap registrant intake each year. Research technician, Reanna Seifert and George Soong who holds advanced degrees in Wood Science conducted laboratory sessions with Robert Gooding and Mark Martinez. Vanessa Van Aert, research technician, collaborated in all of the preparatory work. Chitra Arcot organized the event.

This year's course attendees found it surprising that we limit our advertising to UBC online media and not commercially beyond. Many found out about the course by word-of-mouth, and interestingly, promised to promote it likewise to friends and colleagues. "This is a well-managed course with top notch professors who know the industry inside out."

Our registrants are invariably young engineers and chemists who want to understand technical aspects of the pulp and paper industry. We get a strong interest from safety officers who visit and inspect pulp and paper mills and want to understand technical aspects of pulp production. Another demographic of registrants are graduate and undergraduate students who plan on working in British Columbia's natural resource sector.



Prof. Rodger Beatson on Chemical Recovery



Reanna Seifert presented an interactive lab session on Freeness



Prof. Robert Gooding gave a lab lecture in the High Headroom Lab as well as another in the classroom (below).





PPC Events

BPI Activities

Alex Stuthridge, BPI's Technical Business Manager, has been very active on grant proposals for the National Centres of Excellence (NCE) and Canada Excellence Research Chair. One NCE proposal for BiRNet was selected to Phase 2 level; this BiRNet proposal is the only one of its kind in biomass and will compete with other ten Canadian proposals on submission this August for a multi-million grant that brings together research, academia, industry and governments for the first time.



Alex has conducted workshops for BioProducts Institute at BCTech conference in Vancouver on May 16 and presented at the 8th Canadian Bioeconomy Conference in Prince George on June 7.

Alex Stuthridge has been tireless in her efforts to speak with industry leaders, government officials, faculty and management of universities across Canada to increase partnerships and activities of BPI, BiRNet and the BioAlliance.



UBC Faculty, Profs. Mark MacLachlan and Lindsay Eltis, spoke about their research intersect with industry applications using advanced biomass technologies at the well attended BioTech conference in downtown Vancouver on May 16.



(Left) Alex advocates the goals of the BioInnovative Renewables Network (BiRNet) at Canada's largest BioEconomy Conference in Prince George, 6 - 8 June. Alex was also a panel member (far right) at this conference.

PPC Events

BPI Seminar Series 2018

The BioProducts Institute's 2018 Seminar Series launched in overdrive with an influx of speakers late Spring. The objective of this series is to bring experts in the realm of biomass, biodesign and bioproducts to speak at UBC so that UBC researchers (students and faculty) gain valuable alliances through such interactions.

Dr. Katalin Barta, Associate Professor, Stratingh Institute for Chemistry University of Groningen, The Netherlands, delivered a lecture on "Sustainable pathways to value added chemicals from renewable resources" on May 25. Katalin described a "cleave and couple" strategy where "cleave" refers to the catalytic deconstruction of lignocellulose or lignin to aromatic and aliphatic alcohol intermediates, and "couple" involves the development of novel, sustainable transformations for the formation of C-C and C-N bonds to obtain a range of attractive products from lignocellulose.



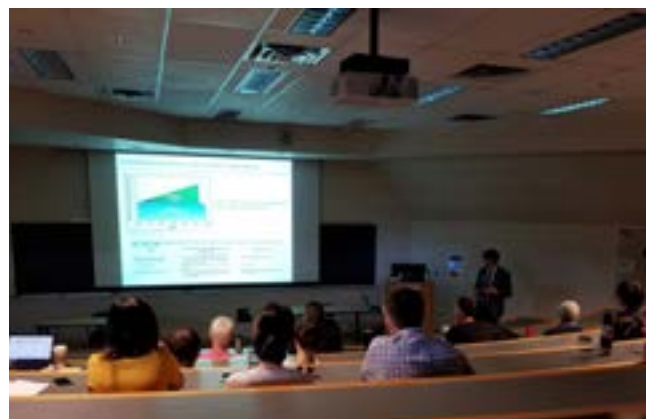
Dr. Katalin Barta

Dr. Jussi Manninen, Executive Vice President at VTT Technical Research Centre of Finland presented his seminar "Present and future of the Finnish Bioeconomy" on Wednesday, June 6 at the Forestry Sciences Centre.



Dr. Jussi Manninen

Dr. Greg T. Beckham is a Group Leader and Senior Engineer at the National Renewable Energy Laboratory. His lecture "Hybrid Biological and Catalytic Processes to Manufacture and Recycle Plastics" was scheduled on June 20. Biomass conversion to chemicals and materials has the potential to offset significant petroleum usage and represent a more sustainable approach to manufacture everyday products. To that end, his research focuses on developing integrated processes from biomass to polymer precursors by combining biological and catalytic processes.



Dr. Greg Beckham

PAPTAC Fellowship Awarded to PPC Alumnus Dr. Joe R.H. Zhao

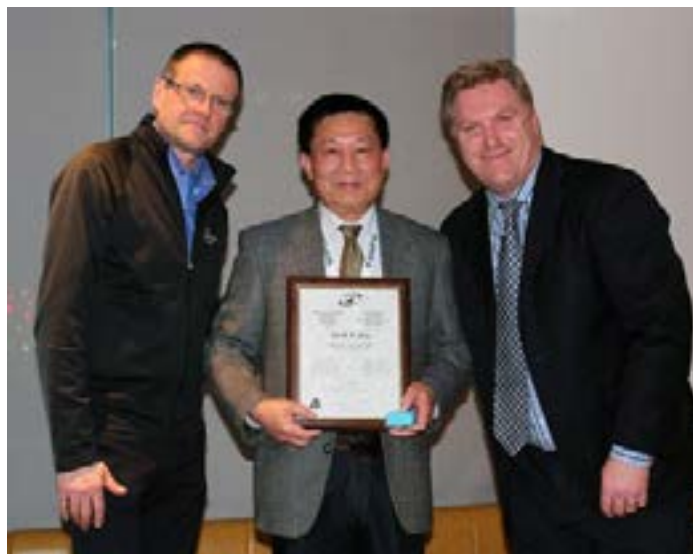
This year's Pulp and Paper Technical Association of Canada (PAPTAC) Fellowship Award has been bestowed upon Joe R. H. Zhao, President and Chief Scientist, of Tri-Y Environmental Research Institute, in recognition of his long-term and significant contribution to the Association and the pulp and paper industry. The award was made on 12 February 2018 at the Annual Meeting of PAPTAC in Montreal.

Dr. Zhao has been an Adjunct Professor in CHBE department, UBC since 2014, and a post-doctoral fellow and research engineer in the Pulp and Paper Centre during the years 1989-1995. Since that time he has established a successful R&D laboratory in Vancouver and developed several new technologies for environmental protection and energy conservation now in large-scale production in China for the pulp and paper industry as well as other industrial and commercial enterprises

Joe graduated as the first doctoral student in 1987 from the newly-started pulp and paper program at South China University of Technology (SCUT), the first such program in China. Following this he joined its faculty. In 1998 was appointed distinguished professor and honorary Chair of this department, a position he retains to this day.

He came to Canada in 1989 after study terms at Oxford University and UMIST in the UK, and remained in Vancouver ever since as a Canadian citizen. As a postdoctoral fellow and research engineer with Prof. Kerekes at UBC, he published several excellent papers in pulp and paper technology, including a landmark paper on the first theoretical understanding of how pressures developed in blade twin-wire formers, the major gap in papermaking knowledge in early 1990s. This paper was presented at the 1994 Tech Section Annual Meeting.

Joe then went to work for Constant Chemicals in Vancouver where he focused on pitch control in pulp
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Eric Ashby, Chairman, Executive Council, PAPTAC, Joe R.H. Zhao and Greg Hay, Executive Director, PAPTAC.

and paper. After this, he started an R&D company in Vancouver initially focusing on environmental control. He invented compact high-performance wastewater treatment reactors and saw these through to commercial production in China. This development saved many small pulp and paper mills from closure.

Later Joe turned his attention to energy-saving innovations, many using wood fibres. He developed a new material (TCM) based on a phase change compound that absorbed and released heat above and below the human comfort range. A key component of TCM is the use of wood fibres to control nucleation sites. This invention was patented in Canada, US, and China, and is now mass produced in China. It is estimated to use 250 M ton fibres over a 10-year period. More recently, Joe invented a high-performance thermal insulation panel (HRP) which also incorporates significant wood fibres. Manufacturing facilities for this innovation are now in the planning stage in China.

Dr. Zhao has received various honours in recognition of his accomplishments. In addition to his honorary academic positions at SCUT and UBC, he was

appointed adjunct professor in Chemical Engineering at Guangxi University in China in 2003. In 2015, he was elected a fellow of the Royal Society of Chemistry (UK) for his outstanding contributions to the advancement of chemical science. He was later admitted as a Chartered Chemist to the Royal Society of Chemistry (UK). He is a registered member of the Association of Professional Engineers and Geoscientists of British Columbia, and is a long-time member of several professional societies.

PAPTAC

Pulp and Paper Technical Association of Canada (PAPTAC) is a Canadian non-profit organization, dedicated to improving the technical and professional capabilities of its members worldwide, and to the advancement of the pulp and paper industry. The organization was founded in 1915 as the Technical Section of the Canadian Pulp and Paper Association. On September 30, 1998 it was incorporated under the name of Pulp and Paper Technical Association

of Canada (PAPTAC) as an independent not-for-profit association. PAPTAC carries out its mission by providing forums in which members may identify present and future technical issues of importance to the industry. These matters are dealt with through the Association's technical communities, conferences, courses, webinars, technical publications and, as appropriate, in collaboration with other organisations.

PAPTAC Fellowship

Fellowship of Pulp and Paper Technical Association of Canada (PAPTAC) is to recognize outstanding individuals who have demonstrated a long-term and significant contribution to either the Association, the pulp and paper and forest products industry or the advancement of science and technology in the industry.

(Submitted by Prof. Emeritus Richard J. Kerekes, PPC)

PPC hosts I-Can BoD Meeting

Early Spring, PPC hosted a day-long annual general meeting for Inventures Canada Board of Directors on the Tuesday of March 20. C-Suite executives from across Canada attended this event in person: Eric Cook of New Brunswick Research Productivity Council, Trevor Cornell of Industrial Technology Centre, Alain Chandonnet, André Fougères and Pierre Galarneau of Institut National d'Optique, John McDougall of Dalcour Innoventures, Wanda Nyirfa and Laurier Schramm of the Saskatchewan Research Council, Jim Smith of BioFoodTech, Roman Szumski of National Research Council Life Sciences, and Adriana Bedoya, Innoventures Canada Executive Assistant

The Board was given a tour of Jack Saddler's lab in Forestry. Alex Stuthridge presented an overview of the BioProducts Institute. The Board was delighted with the hospitality and services they received during their stay at UBC.



Tour of Dr. Jack Saddler's labs in the Forestry Building, UBC





PPC News

New Arrivals at PPC

Over the span of six months, PPC has welcomed several newcomers in the guise of co-op students, work-learn students, visiting scholars, and contract staff. While a few of them have already moved on or back to their original locations, many others continue to use PPC as their operating base. When a new guest arrives, George Soong, Building Operations and Safety Officer trains the visitor on mandatory safety procedures in labs and in the office in accordance with UBC standards. Each visitor is then tested on the information provided, and the results of these online tests are saved in their Personnel folders.

Visiting Scholars:



Arash Alizad



Daniel Oliveira



Guilin Hu



Khalil Keraghel



Magne Rudshaug



Thibaut Quatrepoint



Vincent Bourcereau



Kai Wang (PhD student)

Co-op Students:



Ashutosh Kamble



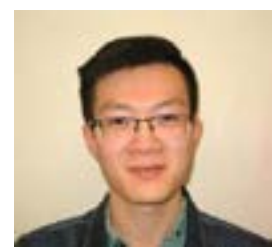
John Shadarevian



Jwal Prajapati



Peter Zhong



Zezhong Li



Timm Treskatis
Post-doctoral fellow



Trevor Stuthridge
Innovation and Strategic Advisor



Awss Dabe
BPI Administrator (temp)

Conferences

Invited Presentations

- Chen, J, H. Trajano, and R.P. Beatson. "Optimization and modelling of hemicellulose oligomers production from pulp mill residues for use as pulp strength additives". 2018. *PACWest Conference, May 20-June 2, Jasper, Alberta, Canada.*
- Englezos, P. "Hydrate Based Gas Separation Technologies". 2018. *Natural Gas Hydrate Systems Gordon Research Conference, February 25-March 2. Galveston, Texas, USA,*
- Harirforoush, R., J.A. Olson, and P. Wild. 2018. "The effect of recirculation mode on bar forces in low consistency refining." *PACWEST Conference, May 30-June 2. Jasper, Alberta, Canada.*
- Kordi, T., S. Hossain, P. Bergstrom, R. Farnood, and T. Uesaka. "Discrete Element Modelling of Plybond Strength". 2018. *PACWEST Conference, May 30-June 2. Jasper, Alberta, Canada.*
- Mirvakili M.N., and P.Englezos. "Enhancing barrier performance of lignocellulosic papers". 2018. *PACWest Conference, May 20-June 2, Jasper, Alberta, Canada.*
- Olson J.A. "Review of Energy Reduction in Mechanical Pulping Research Program with emphasis on LC Refining." 2018. *PaperWeek Canada Conference, February 8, Montreal, Quebec, Canada.*
- Rubiano Berna, J.E., C. Sandberg, D.M. Martinez and J.A. Olson. "Theoretical study of systems composed of low consistency refining and pressure screenin. 2018. *International Mechanical Pulping Conference, Trondheim, Norway.*
- Tian H., and R.B. Gopaluni. "Moving Horizon Estimator Design for Mechanical Pulping Process". 2018. *PACWest Conference, May 20-June 2, Jasper, Alberta, Canada.*
- Zaman, E., and J.A.Olson. "A numerical study on developing a hydrocyclon-specific turbulence model". 2018. *PACWest Conference, May 20-June 2, Jasper, Alberta, Canada.*

Other presentations

- Englezos, P. "Gas recovery through the injection of carbon dioxide or concentrated flue gas in a natural gas hydrate reservoir". 2018. *OTC Asia, Kuala Lumpur, March 20-23.*

Publications

Papers Published in Peer-reviewed Journals

- Fernandez F., D.M. Martinez, and J.A. Olson. 2018. "Investigation of low consistency reject refining of mechanical pulp for energy savings." *Nordic Pulp and Paper Research Journal.* 33(1):17-22.
- Harirforoush R., J.A. Olson, P. Wild. 2018. "Indications of the onset of fiber cutting in low consistency refining using a refiner force sensor: the effect of pulp furnish." *Nordic Pulp and Paper Research Journal.* 33(1):48-57.
- Massah, M., D. Sun, H. Sharifi and P. Englezos. 2018. "Demonstration of Gas-Hydrate Assisted Carbon Dioxide Sequestration through Horizontal Injection in Lab-Scale Reservoir". *Journal of Chemical Thermodynamics.* 117:106-112.

(Continued overleaf)

Publications

Papers Published in Peer-reviewed Journals

- Rubiano Berna J.E., D.M. Martinez, and J.A. Olson. 2018. "A comminution model parametrization for consistency refining," *Powder Technology*. 328: 288-99.
- Yuan Z, Y. Wen, and N.S. Kapu. 2018. "Ethanol production from bamboo using mild alkaline pre-extraction followed by alkaline hydrogen peroxide pretreatment". *Bioresource Technology*. 247:242-249.
- Yuan Z, Y. Wen, N.S. Kapu, and R. Beatson. 2018. "Evaluation of an organo-based biorefinery process to fractionate wheat straw into ethanol and co-products". *Industrial Crops and Products*. 121:294-302.

Announcements

The Stork Visited



Post-doctoral fellow and ERMP researcher **Zhaoyang Yuan** became a proud father on the birth of his first child, a boy, in Michigan, USA, in April.

PPC sends the new parents warm congratulations.

Meaghan Miller, staff at PPC and Program Manager of the Energy Reduction in Mechanical Pulping (ERMP) program delivered a healthy boy at the Vancouver Women and Children's Hospital on the Easter Sunday of April 1. Her son, christened Arlo weighed 7 lb and 3 oz. Baby Arlo is pictured on the right at 3 months.

Baby Arlo at 3 months enjoys a laugh with his mum.



Upcoming Events

BioProducts Institute's Seminar Series: PPC Community will be notified of these seminars as each is scheduled.

BioProducts Institute's Research Day on the Wednesday of September 12: this is a multi faculty event showcasing research from undergrads, grads, post doctoral fellows and faculty. Full day programme of events will be advertised on ppc.ubc.ca

UBC's Imagine Day on September 4.

ERMP Steering Committee Meeting chaired by Dr. James Olson is likely to be held early October. Partners will be advised of the date soon.

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