



2019

INTERNATIONAL

Forest
Biorefining
Conference
IFBC • 2nd

Symposium on
Lignocellulosic
Materials
ISLM • 4th

BRI Hosts A Joint International Conference Event

CONFERENCE OVERVIEW

The joint 2nd International Forest Biorefining Conference (IFBC) and 4th International Symposium on Lignocellulosic Materials (ISLM) took place this June 9-12, 2019 at the Victoria Inn in Thunder Bay and welcomed researchers and industry leaders from around the globe. The conference was opened with a traditional indigenous prayer performed by Elder Gerry Martin. Representative Megan Wyant addressed the conference on behalf of the Honorable Patty Hajdu, MP for Thunder Bay - Superior North and Minister of Employment, Workforce Development and Labour. She was followed in welcoming the conference delegates by Thunder Bay Mayor Bill Mauro, then Lakehead University's Vice President, Research and Innovation, Dr. Andrew Dean, and BRI Director and Conference Chair, Dr. Lew Christopher. The 2019 IFBC-ISLM was attended by a number of internationally respected scientists, researchers and business leaders who all help shape the future of the growing Bioeconomy. Plenary speakers included Dr. David Nanang, Director General, Natural Resources Canada, Great Lakes Forestry Centre; Dr. Adriaan van Heiningen, University of Maine and Fellow of the Chemical Institute of Canada; Dr Robert Brown, University of Iowa and Anson Marston Distinguished Professor in Engineering; Dr. Ludo Diels, University of Antwerp, and Research Manager for VITO, Belgium; Matti Heikkila, Chief Technical Officer, Metgen, Finland; Dr. Theo van de Ven, McGill University, and Dr. Warren Mabee, Queen's University. This year's theme "A Future Bioeconomy: Cross-Sector Progress and Innovation" spanned five topics - Biomass, Biorefining, Biofuels,

Bioproducts, and Bioeconomy. Each of these topics was further discussed by a discussion panel. Overall, with over 100 registrations, the conference agenda included 40 speakers and 30 poster presenters organized in 12 unparalleled sessions. The posters were presented by students from Lakehead University and from other universities in Canada, the US, and Brazil.

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Highlights From Student Presentations



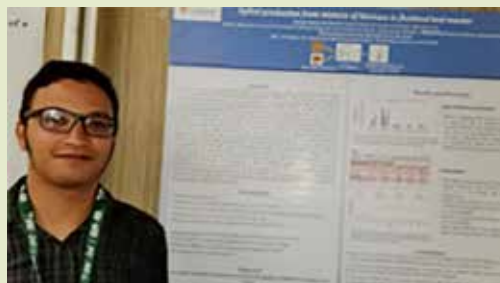
Ashraf Albahri (MSc student, Biology) presented his work “Enzymatic Production of Fermentable Sugars from Low-Cost Pulp and Paper Mill Side Streams”



Mahdieh Samavi (PhD student, Biotechnology) delivered a talk on “Green Bioconversion of Hemicellulose Prehydrolysate to Epoxidized Oil Using Chemo-Enzymatic Route”



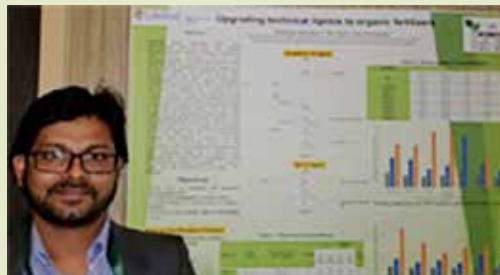
Liam Kelly (MSc student, Environmental Engineering) presented his work “Biomass Modification for Selective Metal Adsorption in Mine Tailings”



Alesson Santos da Silva (BSc visiting student, Brazil) presented his work “Xylitol Production from Mixture of Biomass in Fluidized Bed Reactor”



Mahshid Mohammidi (PhD student, Biotechnology) presented her work “*Umbilicaria muhlenbergii*: A Promising Source of Lichochemicals with Significant Anticancer Potential”



Shrikanta Sutradhar (PhD student, Chemistry and Materials Science) presented his work “Upgrading Technical Lignins to Organic Fertilizers”

The conference was sponsored by CRIBE (Centre for Research & Innovation in the Bio-Economy), Domtar, the CEDC (Thunder Bay Community Economic Development Commission), the Business Development Bank of Canada (BDC) and Lakehead University's Graduate Studies Office. Community Partners included

Firedog Communications, Destination Thunder Bay, and the Thunder Bay Chamber of Commerce. Conference presentations and abstracts can be viewed at the conference website <https://ec.lakeheadu.ca/ifbc/home> and at <https://drive.google.com/drive/folders/1WhOLQ3dv2d4UVzeQoPiJvFhrkyAhOnNg?usp=sharing>

Conference Review

by Tom Browne

Principal at Tom Browne & Associates



"The second edition of this conference, hosted by Lakehead University and sponsored by CRIBE, was held in Thunder Bay, June 9-12, 2019. I hadn't been back to Thunder Bay since the last conference in March 2017. The big news in Thunder Bay, at least in the biorefinery field, is the recent announcement of the new TMP-Bio pilot plant by FPIInnovations and the Resolute Forest Products mill (control click [here](#) and [here](#)). As described by *Zhirun Yuan* of FPIInnovations, this was made possible through large investments by governments at all three levels as well as the two industrial partners. I am particularly excited about this because the patent for this process has my name on it, and because I started the process of building this pilot when I was still research manager. As with everything, it took much longer than expected, but better late than never. Briefly, the process uses a combination of chemistry and mechanical action to reduce woody biomass to sugars and lignin, using simple and proven pulp and paper technologies; competition comes from other hydrolysis and steam explosion processes. Sadly, no tour was possible, and while my name is on the patent, I am not privy to recent progress, so I can't spill anything confidential.

Beyond this, the conference (control click [here](#)) included high-level overviews, detailed reports from a range of graduate students, and a day on business and marketing issues which included a session explicitly on the challenges around scale-up. Some highlights follow.

Matti Heikkila, Chief Technology Officer of Metgen, covered the EU approach to a circular economy. As always, staggering amounts of money are being spent in the field, hopefully leading to rapid progress. The key point for me, however, was that the cost of gene sequencing is currently decreasing by half every 4 months, a staggering rate of advance and one that implies we can expect very rapid development in this field. The forest biorefinery field desperately needs breakthroughs in enzyme applications for lignin and cellulose, and the rapidly decreasing cost of this technology should allow smaller firms to move much more quickly in this direction. Metgen, as an enzyme producer, is developing interesting new strains, and this is worth tracking.

Ludo Diels of the Flemish research institute, VITO, provided an overview of some of the pathways under development in the EU, specifically in the area of lignin-based products. Driven by market pull from brand owners, processes for aromatic chemicals from lignin are being moved to pilot scale. It would be very nice if the Canadian forest sector had some market pull! Market push, as I discovered during my career as research manager, is a bit like pushing a rope, uphill, with rabid raccoons dragging the rope back downhill overnight.

Warren Mabee of Queen's University provided a typically thought-provoking, high-level view of carbon capture and storage. Termed carbon capture and reuse, it starts with locking carbon up in long term storage, not in the form of carbon dioxide injected into old oil wells, but in the form of wooden tall buildings. Subsequent steps, when the building needs to

be replaced, involves recycling that carbon into progressively shorter-term uses until its end use as a fuel. The key aspect is sequential rather than parallel use of wood in applications of decreasing value, which keeps the carbon involved out of the atmosphere for a longer time. Policies are needed to encourage this long-term sequestration, by providing a benefit to carbon equity, similar to the equity that a home owner builds through mortgage payments. Rewards for designing a building for easy and rapid disassembly for recycling would be a key policy initiative. The issue, of course, is that this will take many years to become effective, but needs to be part of the toolbox to fight climate change in the long term.

In the same context, *Ian de la Roche* of UBC described ongoing development of tall buildings of wood. While progress is rapid, the number of such buildings world-wide is still small; building and fire codes are part of the challenge, as well as stiff competition from cement and steel producers.

As always, a large contingent of graduate students and their supervisors provided updates on a range of processes and products, involving plenty of detailed chemistry. I'll pass on this, mainly because I am poorly placed to comment on chemistry; there is a lot of very high-quality work going on in university labs and the fact that I am not providing detailed reviews should not be taken as a comment on quality.

Pedram Fatehi of Lakehead University provided the highlight in this area. This was a review of processes for grafting other molecules to lignin. The ideal pathway is an aromatic monomer from lignin, but this is technically and economically a long way off. While these processes are being developed, the ability to use lignin as it comes direct from the kraft mill will keep the lignin plants in Plymouth and Hinton running until new transformation processes are available and economically feasible.

Day 3, sponsored by CRIBE, focused on business issues and challenges in scaling up. *David Mackett* and *David Flood*, representing First Nation communities in Northern Ontario, told heartbreaking stories of repeated delays in getting community heat and power systems built. It should be obvious that the objective, of getting these communities off Diesel power, which benefits only the oil companies, and on to wood-based systems, which provide jobs and opportunities for residents, is critical, but politicians don't always see this. The issues facing First Nations were brought home by the presence in the conference hotel of the entire population of one such northern community, forced out of their homes by flooding. Hopefully progress will be made before the next conference, specifically on the stalled distributed heat and power systems as well as on the broader challenges facing First Nations in Canada.

Scale-up stories from Domtar, Iogen and several small start-up firms highlighted the pitfalls that await, even if you have a solid technology that is economically sensible. I was asked to talk about the pathway taken to get the LignoForce process from the FPIInnovations laboratories in Pointe-Claire, Quebec, to commercial scale at the West Fraser mill in Hinton, Alberta; getting the technology to work, economically, was the easy part. The overall message is that it's challenging, and unexpected non-technical barriers will throw wrenches in even the best-laid plans.

Overall, it was another good conference, documenting the extensive progress since the last one in 2017, but also the ongoing challenges still facing the industry. Hopefully progress, as measured by the number of commercial activities started up, will accelerate between now and the next one."

Feedback From Conference Attendees

Post conference survey feedback was very positive with respondents suggesting that they were able to make connections during the conference/social activities. Over 90% of respondents stated that they would return if this conference was hosted again, and 80% rated the event as “very good” or “excellent.” Attendees stated that the “presentations were very well done,” and that there was a “good cross-section of speakers.” Several conference delegates indicated that they liked the strong forest biorefining focus, the format of panel discussions following each session topic, and the lack of parallel sessions.

Anne Wadell, CRIBE Board Member: “I would like to express my appreciation for the conference, I enjoyed every aspect including the hospitality and getting to see some of the city. The innovation is not only at BRI and Lakehead but in the restaurants and the new developments around the city.”

Jie Wang, University of Alberta: “Thank you for organizing the IFBC conference. I enjoyed a lot and got to know lots of experts in our field.”

The conference attracted the attention of the local media. The following link from the TBT News gives a brief overview of the event: <https://www.tbnewswatch.com/video/tbt-newshour/video-june-10-2019-body-found-1500510>

Recent News



From Left to Right, Mahdiah Samavi (PhD student, Biotechnology), Dr. Sudip Rakshit, Ellen Caroline Silverio Vieira (PhD student, Biotechnology), Liam Kelly (MSc student, Environmental Engineering)

Dr. Sudip Rakshit, Canada Research Chair (Tier 1) in Biorefining and Bioenergy Processes and a member of BRI was awarded the *Lakehead University Faculty Innovation Award* for his project “Rapid composting of post-use plastics.” The award was presented to him at the LU Research and Innovation Week Awards reception held on February 28, 2019. Dr. Rakshit will also take over as the *Chairperson of the Department of Chemical Engineering* here at LU on July 1, 2019. He plans to use this opportunity to facilitate research collaboration with industry, other universities and research organizations in the region and beyond. He can be contacted by email at: srakshit@lakeheadu.ca



Bill Maloney, Director of Industry Research Partnerships, presenting on Lakehead University’s Bioeconomy research capacity at the Canadian Embassy in Sweden.

Bill Maloney recently joined the Office of the Vice-President, Research and Innovation as the Director of Industry Research Partnerships. In his role, Bill will lead the development of research partnerships with industry and enhance the leading role of Lakehead University in knowledge-based innovation and economic development in our regions. Bill graduated from the University of Toronto with a degree in Commerce and Biology. He has over six years of experience building partnerships with government, First Nations, industry and academics. Bill is looking forward to working with the BRI to help build new partnerships and to support research initiatives and innovation.

Lakehead University participated in the **Canadian Bioeconomy Trade Mission** to the Netherlands and Sweden, April 1-5, 2019. The Mission was organized by Biomass North, and the delegation attended the World Bio Markets conference in Amsterdam and visited the Embassy of Canada in Sweden. Bill Maloney attended the Mission on behalf of Lakehead University, and met with companies, academic institutes and government agencies including Nestle, Lego, University of Amsterdam, RISE and Vinnova. The Mission showcased the vibrant and expanding bioeconomy and

provided insight into the opportunities for the BRI to enhance collaborative research projects with European organizations. At the World Bio Markets conference, many organizations including Michelin tires and the Bio-Based Industries Joint Undertaking (BBI JU), a 3.7 billion Euro initiative between the European Union and industry, discussed their goals to remove fossil fuel-based products from their value chain. The BRI continues to develop cutting-edge research and IP that align with these global initiatives, and is looking forward to building off the relationships formed through the Mission.

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