

An Update from the Department Head

Time keeps rolling along! It was another busy semester in the Department of Biosystems Engineering. Highlights included presentations by undergraduates in courses BIOE 2580 Design Trilogy I, BIOE 3580 Design Trilogy II, and BIOE 4240 Graduation Project. I remember the look of surprise on the faces of some 2nd year students when they walked into the classroom on the day of the final project presentations and saw snacks waiting for them. New Master's students also had their opportunity in the spotlight when seminar posters were presented. New Ph.D. students will have their chance in just a couple of months!

2012 is a big year in the world of sports with the Summer Olympics being hosted in London later in the summer. 2012 is also a big year for the Faculty of Engineering as we will undergo an accreditation visit later this fall. We have already been working hard towards preparing the documentation which will assure our accreditation in the years ahead. If you happen to see me wandering through the halls of the engineering building midway through the afternoon, it is probably because I need a break from the endless tables of information that comprise the accreditation report!

I trust you will enjoy reading through the information that has been compiled in the pages that follow.

Danny Mann, Head

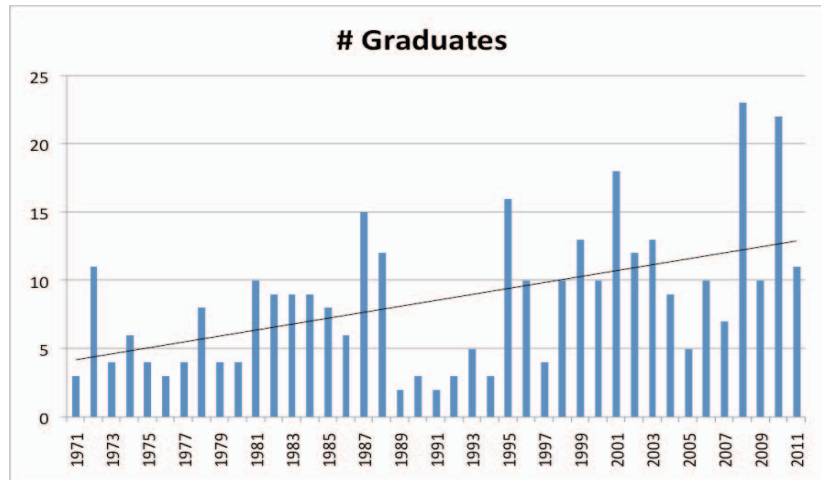
Graduation

Congratulations to David Wildeman who received his B.Sc. (BioE) degree in October 2011 and to Jennifer Brown and Xi Chen who will receive their degrees in February 2012.

Congratulations to Jay Mak (M.Sc.) and Mahesh Sivakumar (Ph.D.) who received their degrees in October 2011 and to David Orchard (M.Sc.), Shahnaz Parvin (M.Sc.), and Aravind Lokhamoorthi (Ph.D.) who will receive their degrees in February 2012.

Graduation Statistics

The Department of Biosystems (formerly Agricultural) Engineering has been awarding B.Sc. degrees since 1971. If our records are correct, there have been 350 graduates of the B.Sc. program. We have compiled a graph showing the number of graduates for each year since 1971. See how your graduating year compares with others – there certainly have been some ups and downs in student enrolment over these four decades. Despite some very low numbers in the early 1990s, the trendline is increasing. The two largest graduating classes have both occurred within the past four years.



Undergraduate Scholarship & Award Winners

Biosystems “Hard Hat” Award for the best safety guard design in BIOE 2580 – Michele Berthelette & Lee Klimpke

Graduate Scholarship & Award Winners

Mohammad Sadek and Saravanan Nandagopal were each selected as recipients of the W.E. Muir Scholarship for Graduate Students in Biosystems Engineering.

Honours Received by Our Professors and Staff

Ron Britton received the Champion of Engineering Education Award from the Association of Professional Engineers and Geoscientists of Manitoba.

Staff News

December 2011 marked the end of an era. Dr. Ron Britton officially retired. Although his most recent (official) position was with the Department of Civil Engineering as a consequence of his Associate Dean (Design Education) position within the Faculty of Engineering, Ron will always be remembered as a member of the Department of Biosystems Engineering. There was a large turn-out for the official retirement reception on December 20, 2011. You may be curious what Ron is doing now that he is retired. I can only partially answer that question because I don't know what he is doing on Mondays and Fridays. For the three days in the middle of the work week, you will still find him in his office at the University (or in the classroom as he is still teaching his graduate class).



Secret Chicken Recipe Revealed!

For many years, there has been a tradition of having a chicken BBQ in September to initiate the new academic year. This is usually advertised as the “secret recipe” chicken BBQ. I must confess that I do not know the history behind this recipe, or the reason why it has been advertised as a “secret recipe” for so many years. Well, the secret has now been revealed. January may not be the ideal time to conduct a Chicken BBQ Party, but perhaps it is the perfect time to begin planning an event for later in the year when the temperatures are a bit warmer. Enjoy!

P.S. I remember my days as an undergraduate student. I remember hauling the old BBQ rack from the storage shed to the BBQ site. I also remember using a hand-held lawn sprayer to apply the secret sauce to the cooking chicken halves. I assume that the sprayer had never been used with herbicides! I would love to hear some of your memories from previous BBQs. Send your memories to Danny_Mann@umanitoba.ca and I can include them in the next newsletter.

Ingredients	Base Recipe	Double Base	1 Rack (20 halves)	5 Racks (100 halves)
Cooking oil	250 mL	500 mL	1 L	5 L
Cider vinegar	500 mL	1000 mL	2 L	10 L
Salt	45 mL -	90 mL	180 mL	900 mL
Poultry seasoning	15 mL +	30 mL	60 mL	300 mL
Black pepper	5 mL	10 mL	20 mL	100 mL
Garlic powder	5 mL +	10 mL	20 mL	100 mL
Eggs	2	3	6	30

* base recipe will be enough for 10 halves if used lightly

** double base is better for 10 halves

Beat or blend eggs, then add oil and beat again. Add other ingredients and stir.

Vary spices to taste ... + means more, - means a bit less.

Store left over sauce (in glass jar) in fridge for several weeks.

Charcoal: Kingsford only! 0.5 to 1.0 lb/chicken at 1 h cooking time
1.0 to 2.0 lb/chicken half at 2 h cooking time

Time required depends on size of halves and air temperature! For average conditions, allow 1.5 h at least! Refueling is always needed after the initial charcoal loading. Keep the heat up for the total time.

Chicken (fryers): Dunn-Rite Food Products Ltd. Ask for split broiler halves
199 Hamelin, Ft. Garry (2 to 3 lb fryers cut in half)
452-8300

Opening of the Farm and Food Discovery Centre at Glenlea

The Bruce D. Campbell Farm and Food Discovery Centre is an interactive interpretive centre dedicated to showcasing the ways in which food is produced in Canada. It is located at the University of Manitoba’s Glenlea Research Station just 20 min south of Winnipeg on Highway 75. The exhibits lead visitors from the farmer’s wheat field all the way to the kitchen table. The Centre is geared to school-aged children although adults also find the interactive displays quite interesting. It is an excellent resource for school field trips. More information is available at the following website: http://umanitoba.ca/faculties/afs/discovery_centre/index.html.

Upcoming Events

Plans are underway for a second tour to Valeant Pharmaceuticals International in Steinbach, MB. Assuming there is sufficient interest from current students (both undergraduate and graduate), we will be arranging transportation to Steinbach on Friday, February 24th for a day-long tour of their facility. A group of students attended last February and had an opportunity to tour the plant as well as spend some time making tablets in their pilot plant facility. Please contact me at Danny_Mann@umanitoba.ca by January 27th if you plan to attend so that we can arrange appropriate transportation. Lunch will be provided by Valeant.

Getting to Know Students, Staff, & Alumni

In the remaining pages of the newsletter, you will find two profiles: a profile of an on-going research project in the Department, and an alumni profile. You'll be amazed at the types of opportunities available to graduates of the Department of Biosystems Engineering! Enjoy the reading. If you have an interesting story or profile that you would be willing to share in a future newsletter, feel free to send me a message at Danny_Mann@umanitoba.ca.

Research Profile: David Levin

David B. Levin is an Associate Professor, Department of Biosystems Engineering. Dr. Levin holds a Bachelors of Environmental Studies from the University of Waterloo and a Masters of Science at the University of Guelph. He obtained his PhD at McGill University in 1987 in Molecular Virology, and was a professor in the Department of Biology at the University of Victoria from 1991 to 2006, when he moved to the University of Manitoba, Department of Biosystems Engineering, to set up a new program in “bioengineering for biofuels and bioproducts”. Dr. Levin holds an NSERC Discovery grant focused on “Bioengineering for 3rd generation biofuels”. Dr. Levin co-Leads the Genome Canada funded project on “Microbial genomics for biofuels and co-products from biorefining processes” with Dr. Richard Sparling (Department of Microbiology), and leads the Hydrogen Production and Purification theme of the NSERC funded Hydrogen Canada (H2CAN) network.

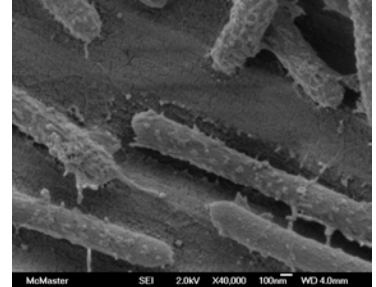


Research Directions

1) Biofuel production via direct cellulose fermentation

The primary focus of my research is to understand the relationships between genome content, gene and gene product expression, metabolic pathway utilization, and end-product synthesis so that we may develop strategies to increase the efficiencies of biofuel (ethanol, butanol, or hydrogen) synthesis during fermentation, using cellulose as a sole carbon source. Our approach integrates microbiology, molecular biology and genome sciences (bioinformatics, genomics, transcriptomics, proteomics, and metabolomics) and bioprocess engineering. My research bridges the gap between science and engineering to develop new processes for next generation biofuel production with lower input costs. We are evaluating gas (H₂ and CO₂) production, and characterizing organic acid, alcohol, and sugar synthesis by *C. thermocellum* (a model of thermophilic conversion) and *C. termitidis* (a

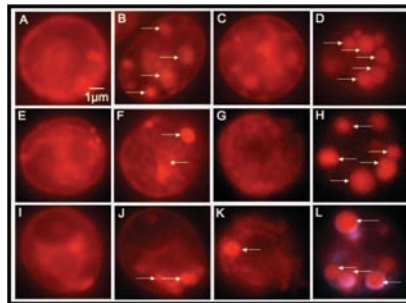
model for mesophilic conversion) cultured on different cellulosic substrates. We are also isolating and characterizing novel mesophilic, thermophilic, and hyperthermophilic bacteria for their potential to convert cellulosic substrates to biofuels and/or value-added co-products.



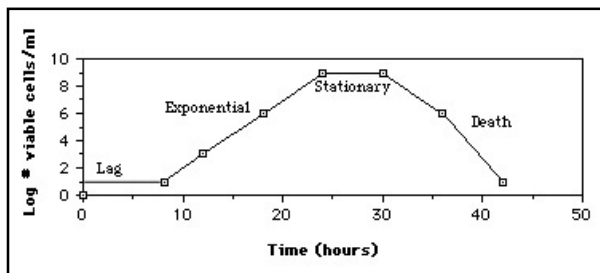
2) Drop-in Fuels

We are comparing three types of microorganisms that can potentially produce chemicals that may be converted to drop-in fuels. The major questions to be addressed by this work are: Can we demonstrate pilot scale production of specific microbes (microalgae, oleaginous yeasts, PHA synthesizing bacteria) that synthesize molecules that can be converted to drop-in fuels using low cost substrates? and which type of microorganism will be the best option for developing industrial scale processes for the production of drop-in fuels? The microorganisms under evaluation are:

1) Microalgae produce neutral lipid storage molecules (triacylglycerides = oils) with carbon chains of 16 to 18 carbons (C16 to C18 fatty acids) with varying degrees of unsaturation (presence of double-bonds in the 2nd or 3rd carbon positions). Some microalgae are able to grow and produce neutral lipid storage molecules under mixotrophic (in light in the presence of an organic carbon source) or heterotrophic (in the dark in the presence of an organic carbon source) conditions. We are investigating the genetic basis and metabolic processes that control neutral lipid synthesis by microalgae, and will develop strategies for scale-up production of microalgae under conditions that optimize neutral lipid synthesis.

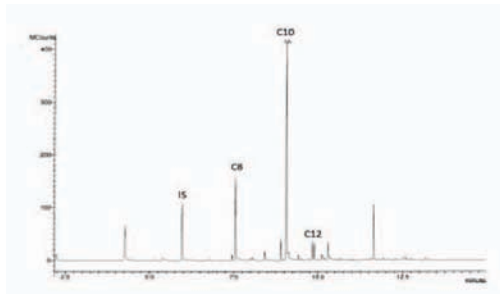
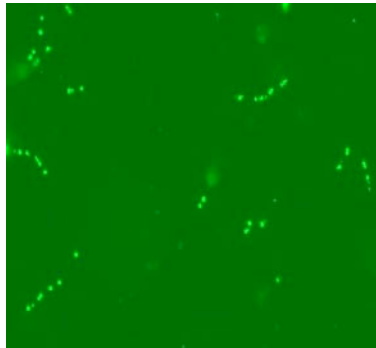


2) Oleaginous yeasts, *Yarrowia lipolytica*: Like microalgae, oleaginous yeasts produce oils with carbon chains of 16 to 18 carbons (C16-C18 fatty acids), with varying degrees of unsaturation. The potential advantage of oleaginous yeasts over microalgae is that they grow much faster and to much higher densities than microalgae. We are investigating the genetic basis and metabolic processes that control neutral lipid synthesis by oleaginous yeasts, and will develop strategies for scale-up production of yeast oils under conditions that optimize neutral lipid synthesis.



3) Medium Chain Length PHA production for biodegradable Plastics and Resins

Scl- and msl-PHAs synthesized by bacteria can be used to manufacture biodegradable plastics and resins. We have isolated several unique strains of *P. putida* and have initiated bioprocess engineering studies to understand the metabolic mechanisms that control cl-PHAsynthesis, and metabolic engineering approaches to increase the dry cell mass percentage of PHAs. We plan to scale-up production of mcl-PHA production by our *P. putida* strains to pilot-scale production, and will evaluate the physical and mechanical characteristics of the bioplastics made from the mcl-PHAs.



Alumni Profile: Mike Gregoire

Mike graduated from Biosystems Engineering in 2002. His main area of interest during his time at the University of Manitoba was the built environment; structures, building envelope, and sustainability.

After graduation, Mike worked for FWS Construction. He was involved in the design of steel structures for large-scale agricultural processing facilities. While there, he also performed some concrete design. He left FWS after three years to work for Crosier Kilgour and Partners (CKP). There, he was involved with the investigation of problems that occupants



were experiencing with existing buildings. These buildings were mostly residential and office buildings. After diagnosing the cause of a problem with a building, he was involved in the design of a solution as well as the project management for the implementation of that solution. Projects included window replacement for high-rise buildings, moisture accumulation within the building envelope, masonry repairs for heritage buildings, and differential displacement of established foundations.

In 2008, Mike joined APEGM to work as the Professional Standards Officer. In this role, he is providing assistance to the disciplinary process (mostly through the investigation procedures), assists in the development of guidelines, and oversees compliance and enforcement activities.

Mike got married to Kiri in 2001. Their son, Finn, was born in 2005 and their daughter, Ember, in 2009. Last year, Mike started a mission to experience every national park as a family. So far, they've managed to experience four out of the 42 national parks. Mike also enjoys playing soccer and photography.

On the question of: What is the one thing you are using/valuing from your education at the UofM? Mike states:

“Through Biosystems courses, Transport Phenomena for example, I learned about moisture transmission through composite enclosures. This is something that Civil engineers don't learn. When I started working with CKP, my supervisor commented that he was impressed that he didn't have to teach me these topics, which was necessary with Civil grads.”