An Update from the Department Head

After a year of Administrative Leave, I (Dr. Danny Mann) am pleased to be resuming my duties as Head of the Department of Biosystems Engineering. I have been appointed to serve another 5-year term as Head of Biosystems Engineering (which officially began on July 1, 2015). It was good to have some time away from meetings, but I will admit that I missed the day-to-day interaction with the wonderful staff and students who make up the Department of Biosystems Engineering.

Dr. Nazim Cicek deserves a big “thank you” for filling the role of Department Head over the past year. With all of the changes that have been happening, it was a challenging year in which to learn the responsibilities of the Department Head.

Speaking of changes, there are several new members to introduce….

Dr. Fuji Jian has been appointed as an Assistant Professor in Biosystems Engineering effective July 1, 2015. Dr. Jian obtained his Ph.D. from our department in 2003 and worked at OPI Systems in Calgary for five years before returning to Winnipeg to work for Dr. Digvir Jayas in the Grain Storage Research Lab for the past five years. It is my pleasure to welcome Fuji to the academic staff. A profile of Dr. Jian and his research activity is provided later in this newsletter.

Drs. Song Liu (Associate Professor), Wen Zhong (Associate Professor) and Mashiur Rahman (Senior Instructor) are joining the Department of Biosystems Engineering as a result of a merger between the Departments of Textile Sciences and Biosystems Engineering. The merger came into effect on July 1, 2015. These individuals provide expertise to the Department in the areas of medical textiles and agricultural fibres. Dr. Lena Horne has been appointed as a Senior Scholar in the Department of Biosystems Engineering. Dr. Horne has numerous contacts in the textile industry and will be a great resource to the Department as we strive to integrate these new individuals and their areas of expertise into the Department of Biosystems Engineering. In addition to the personnel joining the Department as a result of this academic merger, we will also inherit some research and laboratory teaching space in the Duff Roblin and Human Ecology Buildings. There is still much work to be done to finalize all of the details of the merger, but we are all excited by this new addition. More information about these individuals and their research programs are provided later in the newsletter.

….. and a special welcome to the newest students in the Department.

- We admitted 38 undergraduate students into the Biosystems Engineering program for September 2015. I look forward to meeting many of you in person in BIOE 2580!
- There are 6 M.Sc. students who were transferred to the Department of Biosystems Engineering as a result of the merger with the Department of Textile Sciences.
- We are anticipating 6 new graduate students (M.Sc. & Ph.D.) for September 2015.
Congratulations Are In Order!

I had the opportunity to attend the 2015 CSBE/SCGAB Annual Conference in Edmonton back in July. Congratulations to the staff and students from this Department who received awards at the Awards Banquet. Our “success” at the Awards Banquet is a tribute to the quality of people that are attracted to this Department. A quick review of the award recipients follows.

**Dr. Qiang Zhang** was named a *Fellow of the Canadian Society for Bioengineering*. The designation of Fellow is reserved for those of outstanding and extraordinary qualifications and experience in the field of agricultural, food or biological engineering.

**Dr. Stefan Cenkowski** was the recipient of the *CSBE Maple Leaf Award*. This is the highest award made by the Society in recognition of leadership in the profession.

**Dr. Suresh Neethirajan** was the recipient of the *CSBE Young Engineer of the Year Award*. Dr. Neethirajan is currently an Assistant Professor in the Biological and Biomedical Engineering program at the University of Guelph, but received both his M.Sc. and Ph.D. degrees from this Department.

**Taylor Kirouac** received the *CSBE Foundation Undergraduate Scholarship*. This scholarship recognizes academic excellence among student members of the Society. It is awarded each year to the student member with the highest GPA in the preceding academic session.

**Samantha Symons** received the *CSBE Undergraduate Thesis Award* for a thesis entitled “Phosphorus sorption capacity of potential sediment capping clay” (Advisor: N. Cicek).

**Amy La** received the *CSBE Graduate Thesis Award* (M.Sc. category) for a thesis entitled “Effectiveness of negative air ionization in reducing airborne porcine reproductive and respiratory syndrome virus (PPRSV) and aerosols” (Advisor: Q. Zhang).

**Valery Agbor** received the *CSBE Graduate Thesis Award* (Ph.D. category) for a thesis entitled “Bioprocessing of lignocellulosics feedstock for biofuels and co-products via consolidated bioprocessing with the thermophilic bacterium, Clostridium thermocellum strain DSMZ 1237” (Advisors: D. Levin & N. Cicek).

Recognition does not come only from the Canadian Society for Bioengineering ....

**Valery Agbor** received an *Emerging Leaders Award* from the University of Manitoba. This award recognizes student leaders based on their contributions to the social, cultural and economic well-being on or off campus.

**Rhianna Holter-Ferguson** has been named as a recipient of the Young Humanitarian Award by the Canadian Red Cross.

**Alain Lagasse** and **Hunter Loewen** were named as recipients of the Dr. G.E. Laliberte and Dr. N.R. Bulley Scholarships.
Research News

Creating a new and sustainable food source for northern communities

Food insecurity is wide-spread in many remote northern communities of Canada. Lack of access to nutritious food has led to a variety of health problems such as obesity, diabetes, anemia, and heart disease in such communities. The proposed innovative greenhouse technologies, complemented by integrated biomass and solar energy systems, provide a sustainable solution for local production of fresh vegetables, improving food security and population health in northern communities. The challenge of operating greenhouses in northern climates is the extremely high energy demand for heating and lighting. The proposed greenhouse technologies will use solar and biomass energy generated from locally available biomass materials. Lighting will be provided by highly efficient LED (light-emitting diode) lights that are specially designed for the spectrum needs of plants. This innovative greenhouse-biomass energy system will be energy self-sufficient and allow the northern communities to locally produce fresh nutritious foods at affordable cost, thus alleviating the food insecurity crisis in the north. Locally available natural and recycled materials will be explored for greenhouse construction. This will not only reduce construction costs but also promote environmental friendly structures. Greenhouses will also provide a vehicle for community gardening, which will offer a wide spectrum of social benefits to the northern communities, including personal wellbeing and community development. Professors Qiang Zhang, Stefan Cenkowski and Kris Dick received $249,306 from the Canadian Foundation for Innovation (CFI) John E. Evans Leaders Fund (JELF).

Development of new ways to monitor stored grain

The grain industry is one of Canada’s most important economic drivers with an annual average production of around 12 billion dollars. Unfortunately, millions of dollars are lost after grains have been harvested and stored due to less than ideal storage conditions that cause deterioration of the stored grain. For many years, researchers in the Department of Biosystems Engineering have been studying this problem. To address the challenges faced by the grain industry, the Canadian Wheat Board Centre for Grain Storage Research (CWBCGSR) was established in 1999. New analytical and imaging equipment will provide the infrastructure to study emerging areas (such as remote bin monitoring, detection of nascent pest infestations, and quantification of contaminants at parts-per-billion levels) that can transform preservation and monitoring of grain during storage. Using the type of electromagnetic imaging that biomedical researchers have used to detect breast tumors, the team lead by Dr. Jitendra Paliwal will attempt to perfect technology that will enable farmers to remotely detect the early stages of grain deterioration (typically referred to as “hot spots”). Professor Jitendra Paliwal, with co-applicants Stefan Cenkowski, Digvir Jayas, Paul Fields, Noel White, Joe LoVetri, Martin Scanlon, and Doug Thomsom received $1.98 million to purchase new research equipment, with $638,298 coming from the Canadian Foundation for Innovation (CFI).
Upcoming Events and Opportunities

- The annual BBQ is planned for later in September. Details will be finalized by the Executive of the CSBE Student Club in the days ahead.

- Current undergraduate students should be aware that there is a CSBE (Canadian Society for Bioengineering) Student Group at the University of Manitoba. Many of the Executive positions have been filled for the coming year, although there are always opportunities for those willing to help out. Feel free to contact this year’s President, Jamie Cheung, at umcheu44@cc.umanitoba.ca if you would like to become involved.

- Join UMATT (University of Manitoba Association of Tiny Tractors) for an opportunity to design and fabricate a fully functioning one-quarter scale tractor for the annual ASABE ¼ Scale Tractor Design Competition. Last year, the team finished in 9th place overall and is anxious to achieve even better this year. For more information, please see http://umatt.org/.

- Students for Sustainability is a group that works with a partner community in rural Honduras to design and build sustainable designs that will benefit the residents of the rural community in Honduras. Students have opportunity to travel to Honduras during February to build what has been designed. Applications are being accepted until September 18, 2015 for the 2015-16 Team. For more information, please see http://thegrowingvillage.org/.

- Engineering World Health (EWH) is a non-profit organization whose mission is to inspire, educate, and empower the biomedical engineering community to improve healthcare delivery in the developing world. There are numerous opportunities available through this organization, including an invitation to form EWH Chapters “to raise awareness among students regarding healthcare challenges and the medical technology issues unique to resource-poor settings.” Is there interest in forming a University of Manitoba EWH Chapter? A Kit build could be planned as an initial Chapter activity. Check out the website (http://www.ewh.org/) for more details. Contact me at Danny.Mann@umanitoba.ca if you are interested.

- You may have noticed that this Newsletter has a very plain format. I do not have a gift for creating a flashy layout. Perhaps one of you has a talent for desktop publishing and would like to help with generation of future newsletters. If so, don’t hesitate to contact me at Danny.Mann@umanitoba.ca. I would be happy to have the assistance of a Newsletter Editor!
Let’s Meet the New Members of the Department!

**Dr. Fuji Jian, P.Eng.**

*Stored Grain Ecosystem Lab*

Phone: 204-474-7965  
E-mail: Fuji.Jian@umanitoba.ca

**Dr. Fuji Jian, P.Eng.** has been appointed as an Assistant Professor in Biosystems Engineering beginning July 1, 2015. Fuji spent time in this Department as a graduate student prior to moving to Calgary to work for OPIsystems Inc. For the past 5 years, Fuji has been back on campus, working as a Research Associate and Sessional Instructor. It is a pleasure to add Fuji to the Department. His expertise in modeling the stored-grain ecosystem will make valuable contributions to the Department as we continue to hold a position of international prominence in the area of grain storage research.

A thorough understanding of the interactions among biological and physical elements in stored-grain ecosystems is key to protecting grain from damage caused by insects and molds. Controlled laboratory studies paired with mathematical modeling are used to predict changes in the entire stored-grain ecosystem as storage time progresses for developing scientific solutions for sound grain storage practices.

Current research activities include studies on insect biology, detection of insects and molds, control of insects and molds, measurement of physical properties of grain, and development of mathematical modeling of the stored-grain ecosystem.

This lab collaborates and shares equipment with the Stored-Products Lab (Drs. Noel White and Paul Fields, Agriculture & Agri-Food Canada) and Imaging and Food Quality Assessment Lab (Dr. Jitendra Paliwal, Department of Biosystems Engineering) under the leadership of Dr. Digvir Jayas (Grain Storage Research Lab).

**Lab Equipment Available**

- Environmental growth chambers
- Over 20 stored grain insect species in cultures
- Small bins (300 kg grain) for pilot scale testing
- FAV units
- Gas chromatograph
- Finite element models (developed by this lab)
Dr. Wen Zhong  
Medical Textiles Lab  
W579 Duff Roblin  
Phone: 204-474-9913  
E-mail: Wen.Zhong@umanitoba.ca

Dr. Wen Zhong obtained her PhD degree in Textile Engineering from the Donghua University in 2002. She received her postdoctoral training with Dr. Ning Pan in the Department of Biosystems Engineering, University of California, Davis. She joined the Department of Textile Sciences, University of Manitoba in 2005. Wen joined the Department of Biosystems Engineering in July 2015 as a result of a merger between Textile Sciences and Biosystems Engineering.

Dr. Zhong is working on functional electrospun nanofibers for biomedical applications, including wound care and tissue engineering. Electrospun nanofibrous as tissue engineering scaffolds can be good substrates for bioactive molecules and drugs to improve tissue repair process by mimicking native extracellular matrix (ECM).

Polymeric micelles formed from amphiphilic copolymers in aqueous solutions are promising as nanoscale carriers for anticancer drugs. Dr. Zhong is also developing various stimuli-responsive nanocarriers that release drugs with efficacy into tumor tissues upon changes in physical and chemical environments, such as redox potential and/or pH, which are two major chemical stimuli to trigger drug release from cargos.

Lab Equipment Available

- Electrospinning apparatus
- Liquid Extrusion Porosimeter
- BET Absorptometer
- Tensiometer
- Viscometer
Dr. Song Liu
dDepartment of Biosystems Engineering
Liu’s research focuses on 1) the development of novel surface engineering techniques for chemically inert semicrystalline polymers; 2) the development of new biocidal and biocompatible materials; and 3) micro- and nano-encapsulation of bioactive agents for their targeted and controlled delivery. He has received over $1.35 M CAD in research funding as PI and close to $1 M CAD as Co-PI or collaborator from various granting agencies (including NSERC, CIHR, CFI and MHRC) for his pioneering work in exploring new durable and versatile surface modification techniques for chemically inert semicrystalline polymers, and developing new broad-spectrum biocides and “smart” polymeric materials. His research group has successfully developed a versatile polyester platform which can allow furnishing the surface with various bio-functionalities via “click” chemistry method in a spatially-controlled manner. This work lays an important foundation for well-controlled durable bio-functionalization of chemically inert semicrystalline polymers for their uses in medical devices such as anti-biofilm catheters, vascular grafts, drug release stents and wound dressings.

Lab Equipment Available

- Anton Paar SurPASS surface zeta potential analyzer
- PerkinElmer elemental analyzer (CHNS)
- Automatic microwave-assisted synthesis system
- Supercritical CO₂ reactor equipped with a UV source
- Automatic apparatus for Layer-by-Layer assembly
- Plasma instrument
- Quartz crystal microbalance
- Cell (mammalian and bacterial cells) culture facility
- Other common equipment for organic and polymer synthesis
Dr. Mashiur Rahman, Senior Instructor  
W583 Duff Roblin  
Phone: 204-474-8509  
E-mail: Mashiur.Rahman@umanitoba.ca

Education

Mashiur graduated with a B.Sc. in Textile Engineering from the University of Dhaka, Bangladesh and completed his Ph.D. at the School of Textiles and Design, University of Leeds, United Kingdom. Mashiur also holds a B.Ed. degree from the University of Winnipeg.

Industry experience

Mashiur has 14 years of experience in the textile industry (spinning, weaving, knitting and dyeing) and has developed and designed textile products for international clothing retailers such as GAP, JC Penney, and Marks & Spencer. He has been co-managing a textile manufacturing business (weft knitting) since 2000.

Academic research/interests

1. **Biomedical textiles:** I am interested in determining the reasons for premature rupture of textile grafts in the human body that have resulted in numerous deaths. Thus far, my research has shown that one of the reasons for premature graft rupture is the synergistic effects of load (yield load) and physiological fluids. This finding has been published in the Journal of Applied Polymer Science (JAPS) and Textile Research Journal. Currently, my graduate student is investigating the ‘Role of Textile Irregularity’ on premature textile graft failures.

2. **Textile fibre from waste stream:** All natural textile fibres that are used today for apparel and non-apparel applications are harvested mainly for fibre and the remainder of the plant materials are left unused. We have successfully extracted fibre from the waste stream of Brassica napus plant, which is commonly known as canola, which is grown for extracting oil from its seed. Further, we have also prepared card sliver by blending 50% brassica fibre with 50% cotton fibre. Making card sliver is the first step towards fibre to yarn and fabric transformation. So far, we have published an international patent on brassica fibre and are currently investigating the impacts of ‘growth stage’ on fibre quality.

3. **Sustainable textile processing:** I have initiated two research projects in the area of sustainable textile processing:
   (a) **Consumer Perception towards Safe Clothing and Workers Safety:** 20% of world total industrial water pollution comes from the processing of textiles. Additionally, the environmental (air pollution and so forth) and health effects (cancer and so forth) of various textile processing methods are well documented in the literature. **As a Canadian consumer, we strongly**
believe that textile and apparel workers must not suffer or die while making clothing for us. Currently, we are investigating the Canadian consumer awareness about the health risks of textile and apparel workers.

(b) **Smart Clothing Choice:** In the next phase of this research, I am planning to investigate the ‘pro-environment’ consumers’ knowledge about the processing steps that are required to produce fabrics for apparel articles. ‘Pro-environment’ consumers have a choice to wear clothing that are made by utilizing fewer textile processing steps, hence less water pollution. One such example is, wearing blue denims instead of esthetically pleasant distressed denims, which require several additional processing steps. Six billion denims are processed each year and imagine how much water we can save from pollution by our **smart clothing choice**.

**Dr. Lena Horne, Senior Scholar**  
E-mail: Lena.Horne@umanitoba.ca

Lena Horne received her B.Sc. and M.Sc. from the University of Alberta. She joined the Department of Clothing and Textiles at the University of Manitoba in 1982. In 1991, she received her Ph.D. from Iowa State University. After 29 years of service, Lena retired in 2012. For much of her academic career, Lena conducted research in textile products for older consumers. In her retirement, Lena continues to contribute to the textiles and flexible materials communities in Canada. She is a member of the Board of Directors of the CTT Group, a Quebec-based technology transfer centre specializing in technical materials. She is a voting member of several Canadian General Standards Board (CGSB) textile method committees and chairs the Committee on National Flag of Canada (One-Event-Only Use). In 2016, Lena will work with Elsevier to develop a new edition of *New Product Development in Textiles*, which was published by Woodhead in 2011.