IGBNEWS

Achievements, awards, and information about the IGB community

Volume 6, Number 7

Featured News

Upcoming Events

Discuss Your Career Opportunities

December 4, 2013
11:00 a.m. — 3:00 p.m.
612 Institute for Genomic Biology

Beth Reudi
Genetics Society of America

Chad Stiening
Entrepreneur-in-residence at Research Park

Dave Labeda
USDA

Juan Velasquez
Procter & Gamble

EBI Seminar Series

December 6, 2013
3:00 p.m.
612 Institute for Genomic Biology

Jocelyn Rose

Department of Plant Biology
Cornell University

"Title to be Announced"

IGB Seminar (ReBTE)

December 10, 2013
12:00 p.m.
612 Institute for Genomic Biology

Princess I. Imoukhuede, PhD

Assistant Professor, Bioengineering
University of Illinois, Urbana-Champaign

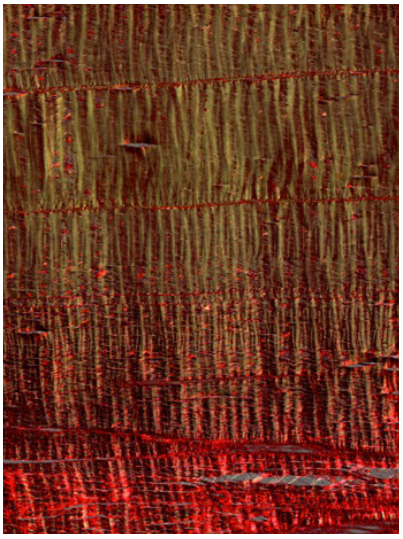
"Bimodal Systems Biology: Integrating Biological Assays with Computational Modeling"

Innovation Celebration

February 27, 2014
5:00 p.m. — 8:00 p.m.
NCSA
1205 West Clark Street, Urbana

The Ninth Annual Innovation Celebration recognizes individuals and organizations that have made significant contributions, taken risks, and provided leadership to ensure the continuing economic success of our community.

Image of the Month



This month's image, "Collagen pleats taken from a horse tendon" was provided by Mayandi Sivaguru of IGB Core Facilities.

It was taken after modifying the light path of the Nanozoomer microscope, using polarization optics.

IGB News

Share your news with the IGB. Send your story ideas to **nvasi@illinois.edu**

Illinois Initiative Creates Futuristic Facility

Researchers at the University of Illinois are realizing their vision for a genomic research facility that will quickly and accurately process and interpret genetic data.

Through the CompGen initiative, the University's Institute for Genomic Biology and the Coordinated Science Laboratory in the College of Engineering are bringing together top faculty in genomic and computational sciences to create a dynamic team that will develop new technology for genomic breakthroughs.

One human genome is made up of about 3 billion nucleotides—enough to fill 130 encyclopedia-sized books that could take nearly 95 years to read, according to the University of Leicester. Four types of nucleotides, represented by A's, T's, C's and G's, create a manual that instructs the cells how to make a human being.

To make sense of this unique manual, geneticists compare numerous sequenced genomes. It's a process akin to trying to find typos or compare words, sentences, paragraphs, and chapters among thousands of books.

The new CompGen facility will help researchers analyze trillions of nucleotides to better understand everyone's genetic manual.

"This system will revolutionize genomic research by allowing scientists to reach deeper understandings of highly complex big data sets," said Institute for Genomic Biology director Gene E. Robinson, who initiated the CompGen Initiative with Ravishankar Iyer, Professor of Electrical and Computer Engineering.

The facility

Illinois researchers believe this facility, with its state-of-the-art hardware and software coupled with innovative algorithms, will make analyzing DNA more accurate and efficient even as technology advances and researchers are able to sequence larger and larger amounts of data.

"I'm very interested in how to accelerate, how to really speed up, the answers to the many-fold questions geneticists ask," Iyer said. "With a new generation of adaptive processing engines, we can configure them to perform accurate genomic data analysis while accelerating the computation."

Your home computer's central processing unit (CPU) can handle everything you need, but slowly. Through the CompGen initiative, a CPU will be created that does only one thing—analyze genetic data—but does it very quickly.

The data will also be kept secure so that people can choose who sees their genetic manuals.

The Illinois Difference

The innovative processing engines and storage technologies to create this facility are available, or on the horizon. Illinois has the unique multidisciplinary expertise to make this facility a reality, said Iyer. "I don't believe that anyone else could do it today."

To launch the initiative, Robinson and Iyer invited top biologists, computer scientists and engineers, and bioinformatics specialists at Illinois to participate.

"Normally, you send out an email saying we have this exciting problem and perhaps 10 percent of those people show up," Iyer said. "But here, everybody showed up. They all had an interest in solving this exciting problem."

The CompGen initiative will also promote dialogue between biologists and computer scientists and engineers as they work to develop this new facility. In the past, biologists have struggled to explain their problems in a language that makes sense to computer specialists, while computer specialists have struggled to find solutions that a biologist can understand.

"Each of the two sides is making a big effort to understand the other," said Victor Jongeneel, Director of Bioinformatics and High Performance Biological Computing (HPCBio) at the IGB and a senior research specialist at the National Center for Supercomputing Applications (NCSA). "They know that they need each other."

Visualization

Eventually, the team hopes to incorporate a visualization component to the project that will help researchers visualize genetic data in real time. Giant screens will display realtime analytics in the foreground while CompGen's hardware, software, and algorithms work in the background.

It will be the difference between reading about human anatomy in a textbook and seeing human anatomy, and the relationships between body systems, using a 3D application on a tablet.

"Geneticists may not be able to accurately visualize how a particular gene is related to other parts of DNA sequences," said Iyer, also a professor in the Coordinated Science Laboratory and who helped jumpstart the CompGen initiative. "In the past, they couldn't really look and see it, but through new mathematical analysis, we can quantify such multi-way relationships for them."

›› CompGen's planned visualization component will help researchers collaborate and see their data in new ways. Rendering by Ryan Durdle.

Support

Already, CompGen has received a $2.6 million grant over 4 years from the National Science Foundation to develop major research instrumentation for this initiative.

Previously, recipients were limited to purchasing equipment off the shelf. Now CompGen has the

freedom to create a new machine that is optimized to analyze genomes.

"It's not just about buying cutting edge hardware," Jongeneel said. "If you just buy hardware, it's an expensive doorstop. The trick is to figure out how to best put this instrument together and how to best adapt it for the tasks at hand."

With financial support from the Office of the Provost and the Office of the Vice Chancellor for Research, CompGen will welcome two new faculty members as well as computer science and engineering students to address these computational problems.

To maximize on CompGen's efforts, Illinois researchers are partnering with more than 15 companies and institutions, including IBM, Abbott Laboratories, Mayo Clinic, Baylor College of Medicine, Microsoft, and the Tata Institute of India, which recently cohosted a "Computing for Genomics" workshop with Illinois in Bangalore.

"We are extremely excited about the prospects of this new initiative to provide scientists with powerful new tools to address some of the grand challenges in biology related to health, food, energy, and the environment," Robinson said. ■

Erik Sacks Goes to Russia

Mosquitos plagued Erik Sacks as he trudged through swamps, marshes and the like in Eastern Russia. After three weeks abroad, he arrived at the Seattle airport with four boxes. Almost two hundred clones were nestled inside two of the boxes, carefully wrapped in scraps of Russian newspapers.

The Backdrop

"I had this crazy idea," said Sacks, an assistant professor of Crop Sciences.

As a member of the Energy Biosciences Institute, Sacks works with *Miscanthus ×giganteus (M. ×giganteus)*, a large, perennial grass hybrid of diploid *Miscanthus sinensis* and tetraploid *Miscanthus sacchariflorus*.

The combination of diploid and tetraploid parents creates infertile triploid offspring, which prevents the hybrid from invading native areas.

In the 1930s, the hybrid was imported from Japan to Denmark, where it was widely distributed across Europe and the U.S. Today, it's the only *Miscanthus* genotype available for bioenergy in the states.

"That's a very risky proposition," Sacks said. He, like many others, worries because without genetic diversity *M. ×giganteus* production is extremely vulnerable to pests and disease. With more and more acres being devoted to this popular bioenergy crop, it is increasingly important to develop new varieties of *Miscanthus*.

For Sacks, this was also an opportunity to create better-adapted cultivars to grow in temperate climates. "We knew from the botanical record that *Miscanthus* can be found in Eastern Russia," Sacks said. "Obviously, those are some pretty cold climates."

With support from the United States Department of Agriculture\Agricultural Research Service (USDA\ARS) Plant Exploration Program and in collaboration with Russia's N. I. Vavilov Research Institute, Sacks and his colleagues planned a three-week expedition in September of 2012 to collect *Miscanthus* in Eastern Russia.

Karen Williams, Coordinator for the USDA\ARS Plant Exploration Program, played a key role in developing the collaboration with the Vavilov Institute. The expedition team included Doug Johnson from USDA\ARS, and Nikolay Dzyubenko, Elena Dzyubenko, Larisa Bagmet and Andrey Sabitov from the Vavilov Institute. The expedition's drivers, Inga Kotlyarskaya and her husband Andrey, normally guide adventurous eco-tourists on trips to experience the beautiful wilderness of Eastern Russia.

›› Energy Biosciences Institute member and assistant professor of Crop Sciences Erik Sacks in Easstern Russia

Location, location, location

The key to finding *M. sinensis* and *M. sacchariflorus* is knowing where to look. As a primary colonizer, *Miscanthus* likes disturbed areas. *M. sacchariflorus* generally grows in wet places near rivers and streams. *M. sinensis* usually prefers dryer areas and can be found on hillsides.

Prior to collecting, the expedition team identified five zones to explore, including the southern tip of Sakhalin Island off the coast of Russia, land surrounding the Amur river, and the area between Khabarovsk and Vladivostok, Russia. To Sacks, this area was reminiscent of the Pacific Northwest, with forested mountains and snaking rivers.

It would take about 10 hours to drive from the top of the northernmost zone to the bottom of the most southern zone. The collection area spanned four hardiness zones, the equivalent of traveling from Urbana-Champaign (hardiness zone 6) to the Minnesota border (hardiness zone 3).

In September, Champaign's average high temperature is close to 80 degrees Fahrenheit while it is about 65 degrees in Khabarobsk. During Sacks' visit, it was unseasonably warm and wet.

"A big typhoon came through and dumped a lot of rain our way," Sacks said. "We couldn't collect at some places because we would need a boat. Some roads were washed out so we had to stop and turn around."

With water came the mosquitos.

"The mosquitos were absolutely, incredibly bad," Sacks said. "Eventually they found their way underneath my netting. Apparently, this was the most important piece of equipment that I brought with me."

The collection

Despite the muck and mosquitos, Sacks and his expedition team collected 181 *Miscanthus* clones (mostly *M. sacchariflorus*) along roads and rivers, in cultivated fields, on clearcutted land, at the edges of forests, and other places.

"Some of them were tall, some were short, some had very thick stems, some thin," Sacks said. "It's hard to parse out what's genetics and what's environment, but once we grow them in a common garden, we will be able to see if these differences are genetic or environmental. I suspect we have collected a fair bit of genetic variability."

They counted the number of stems per half meter squared, measured the plants' height and stem diameter, gathered seed, collected herbarium specimens, dug up rhizomes, and recorded GPS coordinates—and pressed mosquitos for good measure.

"We also thoroughly cleaned the rhizomes with toothbrushes and buckets of water because soil from overseas is not allowed in the U.S.," Sacks said. "Then we packed them in moist newspaper and placed them in Ziploc bags with labels."

They made three sets of everything—one for Russia, one for the USDA\ARS, and a backup set that would be sent to a collaborator in Denmark.

Future studies

Once Sacks returned to the United States, the boxes of clones and seeds were shipped to the USDA Animal and Plant Health Inspection Service's National Plant Germplasm Quarantine Center in Maryland and the duplicate set of clones were forwarded on to Denmark for safekeeping.

The first specimens to complete the quarantine process were released to Sacks this August. They will be incorporated into the USDA\ARS National Plant Germplasm System, where they will also be available to other scientists for research purposes.

Next, Sacks plans to use molecular markers to understand whether these collections are from one population or several different populations. The answer will help him figure out how to go about creating new hybrids of *Miscanthus* and even sugarcane, a close relative of *Miscanthus*.

Maybe these new hybrids will be extra cold tolerant. Maybe they will have new resistance to diseases and pests. Maybe they will tolerate water logging. Maybe they will help us create a better fuel alternative.

"We can dream of all these things—they are not out of the realm of possibility," Sacks said. "There is a lot to explore, and this collection will be available for people to do that exploration over time." ■

Research

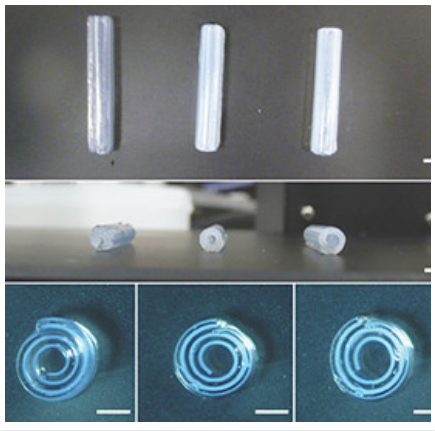
Slow and steady: A Drug Delivery Implant That Folds–And Paces–Itself

Researchers who seek to improve drug delivery systems encounter a principle that evokes the fabled race between the tortoise and the hare: many of the chemicals produced naturally by the body to promote growth or healing are released in a steady, controlled manner. Although intuition suggests that more medicine means a faster cure, drug delivery devices meant to reproduce this type of signaling are actually less effective if they release (and run out of) drug too quickly. Finding better ways to sustain this type of biological signaling over a desired treatment period is important to a variety of medical advances, including tissue regeneration, but creating materials that mimic this controlled release has proved technically challenging.

Associate Professor of Chemical and Biomolecular Engineering and Institute for Genomic Biology member Hyunjoon Kong and collaborators have developed an ingenious solution; an easily synthesized substance that, when implanted in tissue or placed in a water-based solution, folds itself into a shape that controls and directs the release of hormones or other embedded drugs.

Hydrogels, water-absorbing solid materials that resemble a sturdier version of Jell-O, have been used previously for controlled biomolecule delivery. Hydrogels can be chemically modified to bond directly to the drug or chemical of interest, and gradually release the drug as the chemical bonds degrade. This approach has several difficulties: the chemical modifications used can negatively affect both the drug and the hydrogel, the process of modifying the gel is usually expensive, and it is difficult to synthesize the gel in shapes that allow the released drug to infiltrate nearby tissue.

To address these difficulties, Kong, Materials Science and Engineering graduate student Kwanghyun Baek, and their fellow researchers created a hydrogel with two layers comprising the same type of material, but made to differ in how each layer expands when exposed to water. These differences are what produce their hydrogel's ability to fold itself into a multi-layered tube.



The way this folding occurs may seem familiar to anyone who has ever curled decorative ribbon with a pair of scissors. As the ribbon is pulled over a sharp edge, the outside surface of the ribbon is stretched more than the inside surface. Since the outside surface is now longer than the inside surface, the ribbon must compensate by curling, with the now-shorter inner surface always taking the inside track.

The two layers of the hydrogel designed by Kong and others behave in a similar way: when placed in solution, the outer layer becomes longer relative to the inner layer. The formerly flat gel rolls up into a tube, one that coils more tightly or more loosely according to what structural properties are selected for each layer of the gel.

One advantage of this tubular shape is that it can be used to physically limit the release of biomolecules of interest. If a drug is loaded into the inner layer of the bilayer hydrogel, the drug-laden surface area that is exposed in the folded shape is very limited; no chemical modifications are necessary to slow and prolong the diffusion of the drug from the gel. The drug will also be forced to diffuse mainly from the two ends of the tube, allowing the release to be directed toward a particular area or tissue.

Baek, Kong and colleagues examined the efficacy of their hydrogel in promoting blood vessel growth when this inner layer was loaded with growth factor; tissue implanted with the self-folding gel showed more vessel growth than tissue implanted with gel strips, rings or discs containing the same initial quantity of growth factor. Because it is relatively easy to produce and control the structural properties of similar self-folding hydrogels and load them with any of a variety of biomolecules, this innovation has a broad range of potential therapeutic applications.

Kong was the principal investigator and Baek the first author on a recent communication in Advanced Materials that reported these and related findings. Other authors of the study were postdoctoral researcher Jae Hyun Jeong, graduate student Artem Shkumatov, and Bioengineering/Electrical and Computer Engineering Professor and Institute for Genomic Biology affiliate Rashid Bashir. The work was reported in the October 18, 2013 issue of Advanced Materials (DOI: 10.1002/adma.201300951).

Image: Baek K, Jeong JH, Shkumatov A, Bashir R, Kong H. In situ self-folding assembly of a multi-walled hydrogel tube for uniaxial sustained molecular release. [Supporting information] Adv Mater. 2013;25(39):5568-5573. ■

IP @ IGB

What is the Office of Technology Management? - Part 2

Patenting Decisions
For technologies the OTMs decide to patent, an initial patent strategy is identified. In most cases, an independent patent law firm is hired to prepare and prosecute the patent application.

Market Assessment
Detailed analyses, sometimes through the engagement of outside consultants who connect with industry experts, add to the OTM's understanding of the potential market for the technology and help determine further patenting and marketing actions. Inventors themselves often help enormously in finding interested licensees because they have many contacts through their own research.

Release License or Assign to Inventor
If the OTM decides not to pursue or to discontinue pursuit of commercialization efforts on an innovation, they will release the invention and may assign the University's ownership rights to the inventors if the inventors are interested in pursuing a patent and commercializing the innovation independently. For any federally funded invention, the federal agency must approve the assignment, which may take a few weeks or months to finalize.

Marketing (Seeking Partners)
OTM staff engage in a variety of marketing activities to advocate for University research and intellectual property. Considerable time and resources are devoted to understanding market needs and contacting potential partners either to license existing technologies or to cultivate relationships, such as sponsored research, that may lead to licenses. The best tools to market a technology vary from industry to industry, therefore the OTM engages in a variety of activities depending on the situation and technology.

These activities may include:

- Showcasing University technologies to venture capitalists, investors, and corporate representatives through OTM-hosted events on campus and around the country
- attending tradeshows and professional meetings
- making calls and sending collateral materials
- producing brochures and sellsheets
- maintaining websites
- sending press releases
- using social media to cultivate contacts
- creating campaigns to promote a portfolio of technologies
- hosting events on campus so that inventors can get to know our services

Finding partners often takes time, since many University innovations are on the cutting edge and well in advance of the needs of the marketplace. The OTM works with inventors and others to determine the best time to market a technology.

Innovation Celebration 2014 Nominations

The Office of Technology Management is proud to partner with event organizers to host the Innovation Transfer award, which is specific to nominees from the University of Illinois.

This award recognizes an individual or group from the University of Illinois whose research has resulted in either a discovery or a work with the potential for significant societal impact.

Nominations will be accepted through December 18, 2013. Nominate yourself or a colleague today by filling out a very brief form that can be found at *www.innovationcelebration.com* ■

Around the IGB

Genome Day

Another sucessful Genome Day

Our 2nd Annual Genome Day was a great success! Many thanks to the over 100 volunteers who helpd to teach nearly 500 participants about DNA, genes, genomes, and evolution through 14 hands-on activities.

This year thanks to the kind assistance of SACNAS we were able to offer all the activities in Spanish as well as English.

See you for the 3rd annual Genomd Day next year on November 1, 2014! ■

Review

IGB External Advisory Board Holds First Meeting

Top University of Illinois members including Chancellor Phyllis Wise and Vice Chancellor for Research Peter Schiffer joined IGB leadership for the first ever meeting of the IGB External Advisory Board (EAB).

The EAB members traveled from across the country and the world to gather at the IGB, and we thank them for their time and commitment to further the goals of our Institute. ■

iGEM

iGEM Team Wins Undergraduate Division

The 2013 Illinois International Genetically Engineered Machine (iGEM) team recently competed in the international jamboree at MIT and was awarded the Best Health and Medicine Project in the undergraduate division, for their project "Cardiobiotics, A Genetically Engineered Approach to Cardiovascular Health." The Illinois team was the only U.S. undergrad team to earn an award in the 2013 international competition, which included 80 participating teams from around the world. ■

Around the IGB

Sustainability Week

Energy farm tour reveals bioenergy crops' sustainability

Students, faculty and staff learned about ongoing research projects at the Energy Biosciences Institute (EBI) Energy Farm during the farm tour at the Fourth Annual Sustainability Week, a weeklong celebration of the ongoing efforts by the University of Illinois to create a more sustainable campus and community.

EBI members spoke about the benefits of sustainable fuel and bioenergy research. The Center for a Sustainable Environment was one of many partners that helped host the event. ■

CEM

Registration Options

The Certificate in Entrepreneurship and Management (CEM) is a program for entrepreneurially minded students and postdoctoral associates interested in understanding the issues in scientific and high technical start-up ventures.

Students interested in the Kauffman FastTrac TechVenture course can still apply by December 13, 2013.

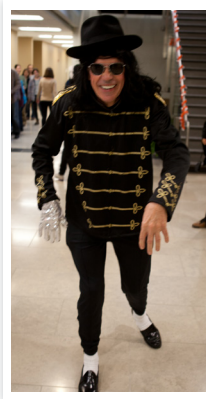
Please visit *http://www.igb.illinois.edu/cem/* ■

Social

Halloween

Thanks to all for a spooktacular Halloween Party. Michael Jackson (Steve Long) won Best Male Costume. Corn on the Cob (Courtney Cox) with special partner "Poe"tatoes won Best Female Costume.

Big thanks to our fabulous volunteers for making this such a successful event! ■



Awards

Jonathan Sweedler

Jonathan Sweedler has won the American Chemical Society (ACS) Award in Analytical Chemistry, recognizing "outstanding contributions to the science of analytical chemistry" for his pioneering development of methods to detect extraordinarily small quantities of neurotransmitters. ■

Robert Haines

Robert Haines, an undergraduate in Bill Metcalf's lab, has been selected as a 2013 award recipient of the American Society for Microbiology (ASM) Undergraduate Research Fellowship. Fellowships are awarded to students pursuing graduate careers in microbiology, and was given to 37 individuals this year. ■

Giving

Walk of Life

Contributing to the Walk of Life is a unique opportunity to simultaneously support our mission and become a permanent part of IGB history.

Visit *www.igb.illinois.edu/about/giving* or contact Melissa McKillip for additional information at *mmckilli@illinois.edu* ■

IGB Fellowship

Become an IGB Fellow

The Institute for Genomic Biology at the University of Illinois at Urbana-Champaign offers a number of fellowships for truly exceptional young scholars who have completed their Ph.D. within the last several years, and are looking for a stimulating and supportive interdisciplinary environment to carry out independent and collaborative research in the field of genomic biology. IGB Fellows will typically spend two years conducting research in one of several research themes in the Institute, and ideally this research will also overlap with two or more of these thematic areas. A personalized mentoring plan will be developed for each Fellow.

We are now accepting applications for new Fellows. Please fill out the application form at *http://www.igb.illinois.edu/content/fellows-application* ■

ADMINISTRATIVE NEWS

University Library

Open Data, Open Code, and Reproducible Research

To mark Open Access Week, the Library's Scholarly Commons invited Dr. Victoria Stodden, Assistant Professor of Statistics at Columbia University and affiliate of Columbia University's Institute for Data Sciences and Engineering, to present "Opportunities and Challenges for Open Data and Code: Facilitating Reproducibility."

If you were unable to attend, a recording of the presentation should be available soon on the Scholarly Commons blog (*publish.illinois.edu/commonsknowledge/*). The slides from her presentation are already available on her website (*www.stodden.net/*).

The Tools for Computational Science slide might be of particular interest to IGB researchers who are interested in exploring resources for sharing code. The tools are categorized as dissemination platforms, workflow tracking and research environments, and embedding publishing.

If you have questions about open access or copyright, feel free to contact librarians in the Scholarly Commons (*www.library.illinois.edu/sc/*) or contact Sarah Williams, Life Sciences Data Services Librarian, at *scwillms@illinois.edu* ■

CNRG

Active Archive

The CBC/IGB active archive is now in production and available through biocluster. If you have any old data that you would like to inexpensively archive (cost/tb/10 years), then this is the ideal place to store it. If interested, please contact *help@igb.uiuc.edu*, and we will configure a location for you to store your data.

Biocluster/GPFS Maintenance

Throughout the month of November, the CNRG will be conducting maintenance on Biocluster during the weekends to move data off a slow hard drive array. Additionally from November 20 through December 1, there will be a more extensive outage of Biocluster while we finish moving this data, update Torque and Moab, and upgrade some networking interconnects. The storage system on Biocluster was initially designed to allow for 200TB of storage, and once these upgrades are finished, it should be faster and hold over 600TB of data. ■

Business

Holiday Break Reduced Service Days

Please be aware for this year there are **four** reduced services days for the holiday break. The IGB will be closed during the holiday break. Please start planning ahead to insure that you will have a sufficient number of vacation days/floating holidays to cover the **four** reduced services days listed below. Employees can choose to use their accrued vacation days and/or floating holidays to cover their time off for the **four** reduced service days.

Monday, December 23, 2013	Reduced Service Day
Tuesday, December 24, 2013	1/2 Gift Day (from Chancellor and the President) and 1/2 Excused Day p.m.
Wednesday, December 25, 2013	Christmas Day Holiday
Thursday, December 26, 2013	Day after Christmas - Designated Holiday
Friday, December 27, 2013	Reduced Service Day
Monday, December 30, 2013	Reduced Service Day
Tuesday, December 31, 2013	Reduced Service Day
Wednesday, January 1, 2014	New Year's Day Holiday

If you have any questions, please contact Jacinda King at 244-2276 or *jkking@illinois.edu* ■

Operations & Facilities

TAS Messenger Service

Transportation & Automotive Services is now offering a courier bike service for the main campus area. This same-day service will allow for quick transit of items across the university.

- Available 9:00 a.m. to 3:00 p.m., Monday through Friday
- Accepts items up to 10" x 13" envelope size
- $10 flat fee per destination

In the advent of inclement weather, the TAS messenger service will use other forms of transportation to make deliveries.

To request a courier, please contact 217-333-3910.

Contact Information
Peter Varney, Associate Director, Transportation & Automotive Services
217-333-7583, varney@illinois.edu ■

Recent Publications

Serao NVL, Gonzalez-Pena D, Beever JE, Faulkner DB, Southey BR, Rodriguez-Zas SL. Single nucleotide polymorphisms and haplotypes associated with feed efficiency in beef cattle. *BMC Genet.* 2013;14:94.

Maxson T, Hensler ME, Molloy EM, Cotter PD, Nizet V, Mitchell DA. Development of streptolysin S inhibitors as anti-virulence drugs. *Abstr Pap Am Chem Soc.* 2013;245.

Gonzalez-Gutierrez G, Cuello LG, Nair SK, Grosman C. Gating of the proton-gated ion channel from gloeobacter violaceus at pH 4 as revealed by X-ray crystallography. *Proc Natl Acad Sci* U S A. 2013.

Fei J, Ha T. Watching DNA breath one molecule at a time. *Proc Natl Acad Sci* U S A. 2013;110(43):17173-17174.

Markelz RJC, Lai LX, Vosseler LN, Leakey ADB. Transcriptional reprogramming and stimulation of leaf respiration by elevated CO2 concentration is diminished, but not eliminated, under limiting nitrogen supply. *Plant Cell Environ.* 2013.

Ha S-, Kim SR, Kim H, Du J, Cate JHD, Jin Y-. Continuous co-fermentation of cellobiose and xylose by engineered *saccharomyces cerevisiae. Bioresour Technol.* 2013;149:525-531.

Balakrishnan CN, Chapus C, Brewer MS, Clayton DF. Brain transcriptome of the violet-eared waxbill *uraeginthus granatina* and recent evolution in the songbird genome. *Open Biol.* 2013;3(SEP).

Arundale RA, Dohleman FG, Voigt TB, Long SP. Nitrogen fertilization does significantly increase yields of stands of *miscanthus* × *giganteus* and *panicum virgatum* in multiyear trials in illinois. *Bioenergy Res.* 2013:1-9.

Seabloom EW, Borer ET, Buckley Y, et al. Predicting invasion in grassland ecosystems: Is exotic dominance the real embarrassment of richness? *Global Change Biol.* 2013.

Wei N, Quarterman J, Kim SR, Cate JHD, Jin Y-. Enhanced biofuel production through coupled acetic acid and xylose consumption by engineered yeast. *Nat Commun.* 2013;4. ■

ILLINOIS

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