



# IGB NEWS

Achievements, awards, and information about the IGB community

Volume 4, Number 1



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Genomics of Neural and Behavioral Plasticity Theme Leader Gene E. Robinson has accepted the position of Interim Director of the Institute for Genomic Biology (IGB) effective March 30, 2011, pending approval of the University of Illinois Board of Trustees. Gene will succeed Founding IGB Director Harris Lewin, who is leaving the University to become Vice Chancellor for Research at the University of California at Davis.

## {Upcoming Events}

### Bridging the Gaps: Grand Challenges and Promising Practices in Interdisciplinary Research and Education in Biology, Engineering, and Health Science

Friday, February 4, 2011

8 a.m. to 3 p.m.

Micro and Nanotechnology Laboratory, Room 1000

Registration is required: <http://summit.research.illinois.edu/content/AttendeeRegistration.aspx>

### Donut Day

Friday, February 11, 2011

8:30 a.m.

Array Cafe

### Pioneers in Genomic Biology

Tuesday, February 15, 2011

12:00 p.m.

IGB Conference Center #612

Jennifer A. Marshall Graves, PhD, FAA, AO  
Head, Comparative Genomics Research Group

Foreign Secretary, The Australian Academy of Science

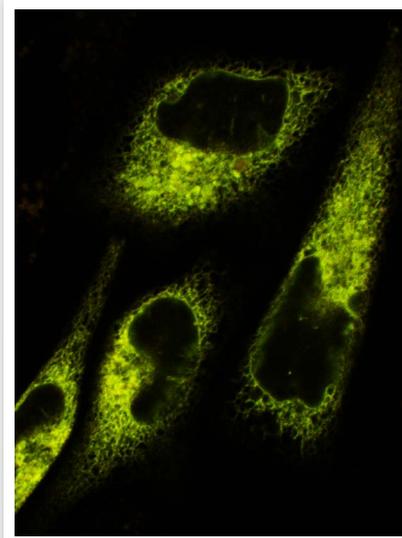
Research School of Biology, The Australian National University

**“Sex Chromosome Evolution and the Future of Men”**

### Fellows Symposium: Save the Date!

Friday, May 6, 2011

## {Image of the Month}



This month's Core Facilities Image of the Month, "CHO cells labeled with redox thiol probe roGFP1-iL targeted to the Endoplasmic Reticulum," was made on the Zeiss LSM 700 Confocal by Vladimir Kolossov and Matthew Leslie from Rex Gaskin's lab.

## IGB News

Share your news with the IGB. Send your story ideas to [mme@illinois.edu](mailto:mme@illinois.edu)



## Team Overcomes Major Obstacle to Cellulosic Biofuel Production

A newly engineered yeast strain can simultaneously consume two types of sugar from plants to produce ethanol, researchers report. The sugars are glucose, a six-carbon sugar that is relatively easy to ferment; and xylose, a five-carbon sugar that has been much more difficult to utilize in ethanol production. The new strain, made by combining, optimizing and adding to earlier advances, reduces or eliminates several major inefficiencies associated with current biofuel production methods.

“If you do the fermentation by using only cellobiose or xylose, it takes 48 hours. But if you do the co-fermentation with the cellobiose and xylose, double the amount of sugar is consumed in the same amount of time and produces more than double the amount of ethanol.”

The findings, from a collaborative led by researchers at the University of Illinois, the Lawrence Berkeley National Laboratory, the University of California and the energy company BP, are described in the Proceedings of the National Academy of Sciences. The Energy Biosciences Institute, a BP-funded initiative, supported the research.

Yeasts feed on sugar and produce various waste products, some of which are useful to humans. One type of yeast, *Saccharomyces cerevisiae*, has been used for centuries in baking and brewing

because it efficiently ferments sugars and in the process produces ethanol and carbon dioxide. The biofuel industry uses this yeast to convert plant sugars to bioethanol. And while *S. cerevisiae* is very good at utilizing glucose, a building block of cellulose and the primary sugar in plants, it cannot use xylose, a secondary—but significant—component of the lignocellulose that makes up plant stems and leaves. Most yeast strains that are engineered to metabolize xylose do so very slowly.

“Xylose is a wood sugar, a five-carbon sugar that is very abundant in lignocellulosic biomass but not in our food,” said Yong-Su Jin, a professor of food science and human nutrition at Illinois. He also is an affiliate of the U. of I. Institute for Genomic Biology and a principal investigator on the study. “Most yeast cannot ferment xylose.”

A big part of the problem with yeasts altered to take up xylose is that they will suck up all the glucose in a mixture before they will touch the xylose, Jin said. A glucose transporter on the surface of the yeast prefers to bind to glucose.

“It’s like giving meat and broccoli to my kids,” he said. “They usually eat the meat first and the broccoli later.”

The yeast’s extremely slow metabolism of xylose also adds significantly to the cost of biofuels production.

Jin and his colleagues wanted to induce the yeast to quickly and efficiently consume both types of sugar at once, a process called co-fermentation. The research effort involved researchers from Illinois, the Lawrence Berkeley National Laboratory, the University of California at Berkeley, Seoul National University and BP.

In a painstaking process of adjustments to the original yeast, Jin and his colleagues converted it to one that will consume both types of sugar faster and more efficiently than any strain currently in use in the biofuel industry. In fact, the new yeast strain simultaneously converts cellobiose (a precursor of glucose) and xylose to ethanol just as quickly as it can ferment either sugar alone.

“If you do the fermentation by using only cellobiose or xylose, it takes 48 hours,” said postdoctoral researcher and lead author Suk-Jin Ha. “But if you do the co-fermentation with the cellobiose and xylose, double the amount of sugar is consumed in the same amount of time and produces more than double the amount of ethanol. It’s a huge synergistic effect of co-fermentation.”

The new yeast strain is at least 20 percent more efficient at converting xylose to ethanol than other strains, making it “the best xylose-fermenting strain” reported in any study, Jin said.

The team achieved these outcomes by making several critical changes to the organism. First, they gave the yeast a cellobiose transporter. Cellobiose, a part of plant cell walls, consists of two glucose sugars linked together. Cellobiose is traditionally converted to glucose outside the yeast cell before entering the cell through glucose transporters for conversion to ethanol. Having a cellobiose transporter means that the engineered yeast can bring cellobiose directly into the cell. Only after the cellobiose is inside the cell is it converted to glucose.

This approach, initially developed by co-responding author Jamie Cate at the Lawrence Berkeley National Laboratory and the University of California at Berkeley, eliminates the costly step of adding a cellobiose-degrading enzyme to the lignocellulose mixture before the yeast consumes it.

It has the added advantage of circumventing the yeast’s own preference for glucose. Because the glucose can now “sneak” into the yeast in the form of cellobiose, the glucose transporters can

## »» Monthly Profile cont.

focus on drawing xylose into the cell instead. Cate worked with Jonathan Galazka, of UC Berkeley, to clone the transporter and enzyme used in the new strain.

The team then tackled the problems associated with xylose metabolism. The researchers inserted three genes into *S. cerevisiae* from a xylose-consuming yeast, *Picchia stipitis*.

Graduate student Soo Rin Kim at the University of Illinois identified a bottleneck in this metabolic pathway, however. By adjusting the relative production of these enzymes, the researchers

eliminated the bottleneck and boosted the speed and efficiency of xylose metabolism in the new strain.

They also engineered an artificial “isoenzyme” that balanced the proportion of two important cofactors so that the accumulation of xylitol, a byproduct in the xylose assimilatory pathway, could be minimized. Finally, the team used “evolutionary engineering” to optimize the new strain’s ability to utilize xylose.

The cost benefits of this advance in co-fermentation are very significant, Jin said.

“We don’t have to do two separate fermentations,” he said. “We can do it all in one pot. And the yield is even higher than the industry standard. We are pretty sure that this research can be commercialized very soon.”

Jin noted that the research was the result of a successful collaboration among principal investigators in the Energy Biosciences Institute and a BP scientist, Xiaomin Yang, who played a key role in developing the co-fermentation concept and coordinating the collaboration. ■

## {IP @ IGB}

# Office of Technology Management’s Intern Program

*Applications are now being accepted.*

Applications are now being accepted for the Office of Technology Management’s sought-after intern program. Join us at one of our information sessions to learn more about this exciting opportunity.

Members of the Office of Technology Management staff and current interns will provide information about how Commercialization Analysts assist in the evaluation, marketing and licensing

of cutting edge technology developed at the University. The intensive training program provided by OTM to successful applicants will assist in them developing an understanding of intellectual property law, market and industry analysis, and licensing methods and techniques.

This intern program is nationally renowned. Our next class of interns begins training in May 2011.

Please join us at the date and time most convenient for you to learn how you can optimize your application.

**Tuesday February 1 @ 12:00 pm**  
College of Law  
Room A

**Wednesday February 2 @ 12:00pm**  
Roger Adams Laboratory  
Room 433 ■

## {Around the IGB}

### IGB Fellows

#### Accepting applications for IGB Fellows



The Institute for Genomic Biology is accepting applications for the IGB Fellows program. Applications are due February 1, so apply today!

Learn more: <http://www.igb.illinois.edu/people/igb-fellows> ■

### Conservation Expo

#### IGB Energy Conservation Expo



The IGB will host representatives from Facilities and Services on February 11 during Donut Day.

Please plan to stop by at your convenience to learn what you can do to help conserve energy at the IGB. ■

### Informatics

#### Informatics PhD Now Offered at Illinois



Recruitment is under way for the first full class in Fall 2011. The degree is administered by I3, the Illinois Informatics Institute.

For more information: <https://www.informatics.illinois.edu/display/infophd/Home> ■

### Visit from EPA Success



The campus had “a surprise visit” from Diane Sharrow of the USEPA on Tuesday, January 11. Landon Hill from DRS brought her to the IGB for her first stop and a tour. Safety Coordina-

tor Bob Mann took them through the labs and glasswash rooms to review how we manage our chemical and biological waste, and we are pleased to report that Sharrow was satisfied that we are handling our waste appropriately.

Please keep up the good work and continue to follow the guidelines established for managing this waste. ■

### Media Seminar

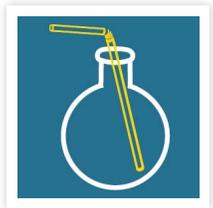
#### Special Media Seminar for Science Faculty

The News Bureau is offering a “Working With the Media” session for science faculty on Wednesday, February 9 from 2-3 p.m. Topics will include “How, When and Why to Explain Your Research to the Public,” “What the News Bureau Does,” and “What Makes a Research Story Newsworthy?” Notable science faculty, including entomology and neuroscience professor Gene Robinson and Beckman Institute Director Art Kramer also will share their insights and experiences. The event will be in Beckman Institute Room 5602.

Registration is free at:  
<https://illinois.edu/fb/sec/7506325> ■

### Café

#### Fountain Soda in Array Café



By popular demand! Array Café is now serving fountain soda. Get your reusable mug for only \$10 – and refills are only \$.50 each!

### Locked out? After hours?

If you get locked out of the building or if you notice urgent building issues after hours, please call 333-0340. This number is answered by Public Safety (after hours) and they will be able to assist you. ■

## ADMINISTRATIVE NEWS

### {Business}

#### Procurement Communications Reporting System

As a result of recent legislation, the Illinois Procurement Code has been amended to require state of Illinois employees to report procurement-related communications online. The Illinois Procurement Code (30 ILCS 500/50-39) states that employees involved in discussions with outside vendors who impart or request material information, or make a material argument regarding potential action concerning a procurement matter (e.g., application, contract, project, or proposal), must report that written or oral communication to the Procurement Policy Board. The employee reporting requirement is managed by the University Ethics Office, and became effective January 1, 2011.

As you might well imagine, there are still many questions regarding the details and specifics of the reporting requirements. Below are some helpful websites that might be of assistance in answering the questions that you might have:

- Instructions and information on the reporting requirements, who must report, what to report, what not to report, when to report, etc.  
<http://www.ethics.uillinois.edu/procurement/reporting.cfm>
- Frequently Asked Questions about the Procurement Reporting Communications requirements:  
<http://www.ethics.uillinois.edu/procurement/faqs.cfm>
- Information Collection Worksheet, which lists the type of information to be collected for those scenarios that are required to be reported:  
<http://www.ethics.uillinois.edu/procurement/Procurement%20Reporting%20Communications.doc>
- Procurement Policy Board’s (PPB) Website, where employees can log on to report any required communications:  
<https://pcrs.illinois.gov/CookieAuth.dll?GetLagon?curl=Z2F&reason=0&formdir=2>
- For questions regarding a decision to report a communication, please contact the University Ethics Office at [ethicsofficer@uillinois.edu](mailto:ethicsofficer@uillinois.edu) or by calling 206-6202. Please note that if the University Ethics Office can not immediately respond to your question regarding the reporting of a communication, the Ethics Office staff will consult with the Executive Ethics Commission to ensure proper direction is provided.

For technical assistance regarding use of the Procurement Communications Reporting System, you may call the Procurement Call Center at 866-455-2897 or send an email to [ppb.pcrs@uillinois.gov](mailto:ppb.pcrs@uillinois.gov)

If you still have specific questions related to reporting requirements for your IGB purchases, please feel free to contact Pamela Rank or Bruce Barnes by sending an e-mail to [purchasing@igb.illinois.edu](mailto:purchasing@igb.illinois.edu). Pamela Rank can be reached by phone at 244-8959, and Bruce Barnes can be reached by phone at 244-1705. ■

### {CNRG}

The Computer and Network Resource Group has deployed an additional node to the high memory cluster, increasing the amount of memory available in the cluster to 768GB of RAM, a 200% increase in the amount of RAM in the system.

Additionally the CNRG is also investigating GPU processing, in particular using the NVIDIA CUDA environment. Please see the link below for applications that already exist that might be beneficial to you:  
[http://www.nvidia.com/object/bio\\_info\\_life\\_sciences.html](http://www.nvidia.com/object/bio_info_life_sciences.html)

If you have any questions regarding either of these items, please do not hesitate to contact us at [help@igb.illinois.edu](mailto:help@igb.illinois.edu) ■

## {Biotechnology Information Center}

### Add DOIs to your EndNote Library



Perhaps you've had this happen to you—the publisher of the article you're submitting is requiring that you provide DOIs (Digital Object Identifiers) for the references that you cite.

Just as you use EndNote to help you format references with the proper volume and page numbers, you can use EndNote to keep track of the DOIs for articles. DOIs will be added automatically to the EndNote records exported out of many databases (e.g., Web of Science, Scopus, PubMed). But if you're finding that many of your EndNote records do not have DOIs—perhaps they were added to your EndNote library before DOIs became so prevalent—the University Library can help. Send us your EndNote library and we will run the citations through a program that will add the DOI to records that don't already have the DOI. Not all articles have DOIs, but most do.

Find instructions for preparing your library on our EndNote support site:  
<http://www.library.illinois.edu/biotech/endnotesupport.html>

Alternatively, you can look up DOIs one by one, using the CrossRef Free DOI Lookup: <http://www.crossref.org/guestquery/>

If you have other questions about using EndNote, or if you would like a training session for your lab on how to use EndNote, contact Katie Newman: 2130 IGB, 217-265-5386, [florador@illinois.edu](mailto:florador@illinois.edu) ■

## {Operations and Facilities}

### Leaving IGB?



On your last day at the IGB please put any cabinet, file or drawer keys in the respective locks for the next person. ■

## {Communications}

### Videos



We are developing videos to add to our website. If you are working on something that you think would make a nice feature, please let us know. Contact Melissa Edwards at [mme@illinois.edu](mailto:mme@illinois.edu) or at 333-0873. ■