



# IGB NEWS

Achievements, awards, and information about the IGB community

Volume 5, Number 1



Featured News

**p. 2** Center for Nutrition, Learning, and Memory

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**p. 5** Administrative News

Professor Gene E. Robinson was officially named director of the IGB in January 2012, following a national search. He has served as interim director since March 2011, and prior to that led the Genomics of Neural and Behavioral Plasticity research theme.

## {Upcoming Events}

### Special Seminar

February 21, 2012

12:00 p.m.

612 Institute for Genomic Biology

Jue D. (Jade) Wang, Ph.D.

*Associate Professor, Departments of Molecular & Human Genetics, Biochemistry & Molecular Biology, and Molecular Virology & Microbiology*

*Program in Cell & Molecular Biology*

*Co-Director, Graduate Program in Cell & Molecular Biology*

*Baylor College of Medicine*

**“Post Genomic Insights into Nutrient Stress and Genome Integrity”**

### Special Seminar

February 24, 2012

12:00 p.m.

612 Institute for Genomic Biology

Saurabh Sinha, Ph.D.

*Associate Professor, Department of Computer Science*

**“Meta analysis of gene expression data from multiple experimental conditions”**

### Pioneers in Genomic Biology Lecture Series

February 28, 2012

12:00 p.m.

612 Institute for Genomic Biology

Saeed Tavazoie, Ph.D.

*Professor, Department of Biochemistry and Molecular Biophysics & Initiative in Systems Biology*

*Columbia University, New York, NY*

**“Decoding the Regulatory Genome”**

### Donut Day

March 9, 2012

8:30 a.m.

Array Cafe

Coffee and donuts while supplies last!

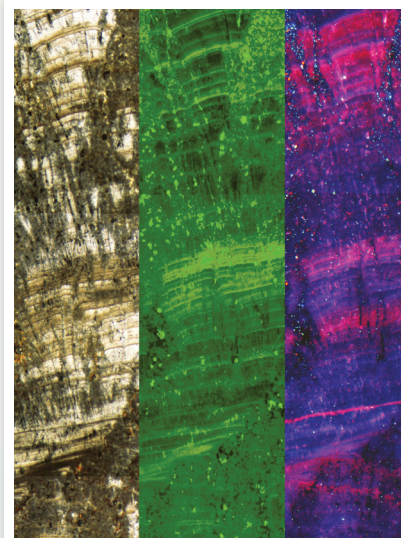
### Array Cafe Hours

Array Café has resumed regular hours:

Monday - Friday from 8:00 a.m. - 3:00 p.m.

Remember that the daily specials are always available on the Array Facebook page—become a fan today.

## {Image of the Month}



This month's image, “High Frequency Layering in Travertine from the Anio Novos Roman Aqueduct,” is courtesy of the Bruce Fouke Lab. The image was taken using the Zeiss Stereolumar v12 microscope.

## IGB News

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

# BrainFood: New Center for Nutrition, Learning, and Memory Established

*Dark chocolate, blueberries, red wine, even kale: every day a different food is proclaimed to have exciting health benefits. Little is known about how these foods improve well-being, but a new Center established at the University of Illinois may soon change that, specifically those benefits related to cognition.*

The Center for Nutrition, Learning, and Memory (CNLM) will support interdisciplinary exploration into whether any compounds in foods might improve learning and memory and, if so, how. This undertaking is significant because it is the first-ever joint project between the Institute for Genomic Biology and Beckman Institute. The Center is supported by a five-year commitment from Abbott.

"Society is more and more interested in health and wellness," says Neal Cohen, director of the CNLM. "We and Abbott saw the possibility of having our first trans-institute enterprise to get an even larger and more disparate group of people around the table to solve what we are all calling a grand challenge: can we find nutrients or compounds that can enhance cognition across the life span?"

Grants awarded by the CNLM will leverage the university's strengths in interdisciplinary research, including the IGB's expertise in genomics and systems research, together with Beckman Institute, the neuroscience program, and the division of nutritional sciences, to understand how nutrition impacts the brain and learning.

It is an exciting undertaking because there is the potential for major discoveries with widespread benefits. While it is well-recognized that the brain is affected by what we eat there is not a lot of evidence yet for what those effects are, says Gene Robinson, director of the IGB and a member of the CNLM's executive committee.

While the Center will certainly test selected nutritional compounds in assays of learning and memory, its scope will also be far broader and deeper.

"Abbott is respected in the market as a science-based company," Robinson says. "They ground their claims in science. That leads, then, to an interest in developing a very broad-based approach to research in this area."



This is not the first collaboration between the University and a commercial enterprise, but it is among the most ambitious.

"There is a general trend in industry to appreciate the prowess of major research universities in both basic and applied research and try to leverage both rather than recreate it in house," said Robinson.

In Abbott's case, the company also has a history of strong ties with Illinois; there are more than 1,000 Illinois alumni working at Abbot. The company also was attracted to Illinois because of the four, highly interdisciplinary groups (neuroscience program, nutritional sciences, Beckman and IGB) that form the center, says Robinson.

"Those four together provide a really attractive basis for engaging with Illinois," he says.

By combining the expertise of all four campus units, researchers will be able to explore, not just the "what," as in what compounds confer what benefits, but also the "how," as in by what pathway or pathways those benefits occur.

"If you do get a compound that improves learning and memory, you want to know the underlying mechanisms," says Robinson. "Those mechanisms are multilayered, so to develop a sound understanding of how a compound is improving learning and memory requires analyzing the effects of that compound at multiple levels, including brain activity, brain chemistry, and also at the molecular levels using tools of genomics and molecular biology."

IGB's expertise in genomics will be critical to the effort and will complement the Beckman's capabilities in studying learning and memory and for brain imaging. IGB's expertise in model

systems also will complement Beckman's work on humans.

"In addition to starting with compounds and asking what effect they might have, if we can get insight into how they work, then we can look for compounds that cause a change in this way. We then can take advantage of model systems research, one of IGB's strengths, as an engine to complement research on humans, which is more expensive and moves slower," says Robinson.

Cohen says that the University's great strength in interdisciplinary research is essential to this complex and multi-faced endeavor.

"The best way to succeed in this grand challenge is to get people from multiple departments and multiple programs and multiple scientific approaches who are experienced at working together and willing to extend themselves further than they have ever extended themselves before," he says.

By being a collaboration across institutes, the undertaking also sends the message that "this is the grandest thing we've ever done," Cohen says. "The scope and promise of the center is even larger than the two institutes. It's a higher order, more interdisciplinary than even one of the institutes."

"I think the campus is excited about the idea of doing something that is grand enough that it can involve a large portion of the university," he adds.

Some projects will receive up to \$200,000, and others can receive up to \$1 million. The total amount will depend on the number and quality of proposals, Cohen said. Funding will be determined by a joint committee from Illinois and Abbott. Additional information about the program is available at [www.CNLM.illinois.edu](http://www.CNLM.illinois.edu). ■



## {Monthly Profile}

### Yong-Su Jin— Microbial Engineering: Of Broccoli, Steak, and Shaquille O'Neal

Whether it's his son's preference for meat over vegetables or the relative basketball skills of a high school player and Shaquille O'Neal, Yong-Su Jin loves to use analogies. And as his work gains a wider audience, those analogies come in handy when speaking to people far beyond the reaches of the IGB.

This past year Jin, a member of IGB's EBI theme and the Department of Food Science and Human Nutrition, and several colleagues received wide attention for successfully engineering yeast to simultaneously ferment xylose and cellobiose, a two-molecule precursor, or dimer, of glucose. Jin describes this achievement as "a significant discovery in the biofuels industry."

Up until that discovery, yeast's marked preference for glucose over xylose created a bottleneck in biomass conversion efforts. By first engineering yeast to ferment xylose, and then "disguising" glucose, by presenting it in the form of cellobiose, the yeast finds both food sources equally appealing. This approach increases the efficiency and productivity of biomass conversion into ethanol. Co-fermenting the two sugars also means that yeast is healthier for it, Jin says. Over the lifetime of yeast, Jin compares it to the difference between his son eating T-bone steak for 12 years and then broccoli for the next seven, versus eating a balanced diet for 19 years.

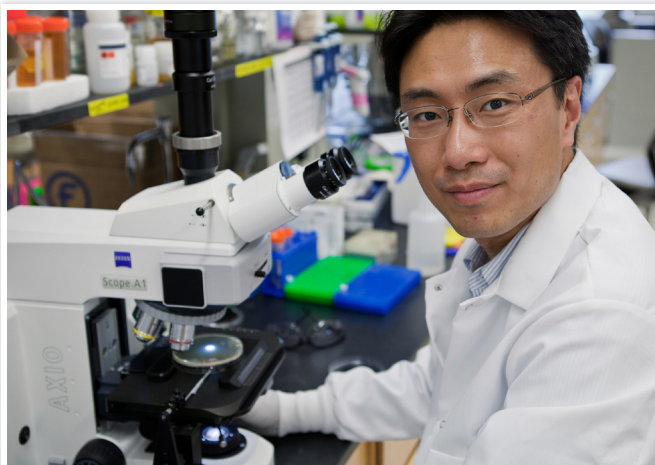
The yeast strain shows so much promise that it has been patented and may be part of a BP-funded ethanol plant currently being built in Florida.

Still, while the co-fermentation behavior is gratifying, says Jin, it is still "sub-optimal. Our immediate goal is to ferment cellobiose as fast as glucose."

Currently the engineered yeast ferments cellobiose and xylose with relatively low enthusiasm. It would be as if Jin's son were offered, not steak and broccoli, but a burger made of steak and broccoli ground together.

"He's not as excited as if it were a steak," says Jin, "but he's happier than if he were offered only broccoli."

The next challenge, says Jin, is to engineer the yeast to eat the burger with as much relish (and speed) as if it were steak.



In another set of experiments with this engineered yeast Jin and his colleagues have found that it also co-ferments, not only xylose, but also galactose, a C6 sugar found in seaweed. This finding suggests that seaweed could be a viable biomass option, particularly for many East Asian countries that don't have much land available for farming and are surrounded by water.

Yet another challenge is to train the engineered yeast to perform well in industrial settings, where there are higher levels of inhibitors, by-products of the fermentation process, that can be toxic to yeast. Again, with an analogy: it's like asking a good high school basketball player (lab strain of yeast) to play basketball against Shaquille O'Neal (industrial strain of yeast, which is better at handling various stresses).

Should you coach a high school player to achieve professional levels, or should you convince Shaquille to come play high school ball? Jin is trying both approaches. He is "training" his engineered yeast to tolerate higher and higher levels of inhibitory by-products, while at the same time his lab is trying to engineer industrial yeast strains to co-ferment cellobiose and xylose, just as he did with the laboratory strain. One problem, he says, is industrial strains of yeast—like top basketball players who aren't too keen on taking instruction—are notoriously difficult to engineer. Time will tell which approach works best.

Jin is applying these same skills to create products beyond ethanol.

"As a metabolic engineer I'm very good at making things, like ethanol, using engineered microbes," says Jin. "But making ethanol is not that fancy because we know all about making it from wine and beer production, so I'm thinking about making a very unique product or one that cannot be made

well using current systems."

One such project is engineering yeast to produce isobutanol, another biofuel, but one that does not have ethanol's corrosive properties and performs very well as a fuel. So far his lab has engineered a yeast strain to synthesize isobutanol, though his yields at this point are low.

Collaborating with Mike Miller, professor in food science and human nutrition, Jin's lab has engineered *E. coli* to produce a relatively rare sugar molecule, 2-Fucosyllactose, that is abundant in human breast milk. It is thought that this sugar molecule might inhibit the colonization of an infant's intestine by "bad" bacteria. Miller wanted to run some experiments to test

this theory, but to do so he would have needed to buy \$1 million worth of the chemically synthesized compound.

"That is a big problem," says Jin. "We needed another way to make this sugar. After looking at the structure I thought my lab might be able to produce it."

Jin's group introduced the enzyme that synthesizes 2-Fucosyllactose into *E. coli* and it now produces a "decent amount" of 2-Fucosyllactose from lactose.

**This finding suggests that seaweed could be a viable biomass option, particularly for many East Asian countries that don't have much land available for farming and are surrounded by water.**

"A given 50 ml flask fermentation represents a couple thousand dollars of the chemically synthesized product," says Jin. "Of course the market size is very, very small," he adds, with a laugh.

But if it turns out that 2-Fucosyllactose does confer some immunity to common intestinal bacteria, Jin envisions adding it to the food of, for example, soldiers.

"Do you know what is one of the most prevalent problems of soldiers outside the US?" he asks. "Diarrhea. It significantly reduces the performance of soldiers."

Describing this project prompts Jin to comment about how much he appreciates being in the IGB. He feels like he benefits, not only because of the infrastructure and the colleagues he has who can help him, but also for these kinds of unusual collaborations.

"If anybody needs my specialty, I'm happy to talk to them any time," says Jin. ■

## {Research}

### Antibiotic-Resistant Bacteria in Galápagos Reptiles



Land and marine iguanas and giant tortoises living close to human settlements or tourist sites in the Galápagos Islands were more likely to harbor antibiotic-resistant bacteria than those living in more remote or protected sites on the islands, researchers report in a new study.

Feces collected at several different sites from free-living reptiles harbored *Escherichia coli* bacteria that were resistant to ampicillin, doxycycline, tetracycline and trimethoprim/sulfamethoxazole. Another bacterial species collected from the feces, *Salmonella enterica*, was found to be only mildly resistant or not resistant at all to the same antibiotics, most likely because of the differing ecology of these two bacterial species in the gut, researchers said.

This is not the first study to find that wild animals living near humans or affected by tourism can obtain antibiotic-resistant bacteria from that exposure, said IGB faculty member and animal sciences professor Roderick Mackie, who led the study. But it does offer researchers and wildlife managers a way to determine which vulnerable animal species are most at risk of exposure to human pathogens.

"Oceanic island systems such as the Galápagos archipelago are ideal for studying patterns and processes of ecology and evolution, such as antibiotic resistance," Mackie said. "Although the data are interesting, we don't have enough data to identify the likely source of antibiotic exposure and origin of the resistance genes, or to draw conclusions about transmission direction."

Also, it is not yet clear "to what extent this potential exposure translates to ongoing exchange of bacterial strains or bacterial traits," the researchers wrote. Further studies are needed "to understand better how human associations influence disease risk in endemic Galápagos wildlife."

The work was carried out by Emily Wheeler as part of her doctoral studies in Mackie's lab, and was supported by a U.S. Environmental Protection Agency STAR Fellowship and a student research grant from the Conservation Medicine Center of Chicago. Postdoctoral researcher Pei-Ying Hong and field biologist Lenin Cruz Bedon, of Isla Santa Cruz, Galápagos, are co-authors on the study. ■

## {IP @ IGB}

### Did you know?

"Public disclosures" of an invention, by anyone, may prevent the ability to obtain a patent if the public disclosure occurs before the patent application is filed.

What is a public disclosure?

- Presentations (including department seminars)
- Publications
- Databases in the public domain
- Websites (including blogs, Youtube, etc.)
- Theses published online

Want to know more? Contact Jen Rice at [jenrice@illinois.edu](mailto:jenrice@illinois.edu) at the Office of Technology Management: [www.otm.illinois.edu](http://www.otm.illinois.edu)

## {Around the IGB}

### Innovation Celebration

#### Nominations Open

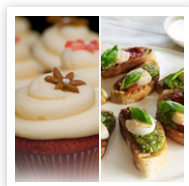


The Seventh Annual Innovation Celebration will recognize those individuals and organizations that have made significant contributions, taken risks, and provided leadership to ensure the continuing economic success of Champaign County, the ongoing success of the University's economic development mission, and the growth of entrepreneurial talent and energy in the community.

For information on the eight awards available, how to nominate (or self-nominate) innovative work being done, or RSVP for the event, visit <http://innovationcelebration.com/> ■

### IGB Bake-Off

#### Bake-Off & Culinary Competition



Join the IGB community for a Bake-Off and Culinary Competition  
**Friday, February 24,  
4:00-5:30 p.m.**

All individuals or groups are invited to attend and participate. Please email [mmckilli@illinois.edu](mailto:mmckilli@illinois.edu) with the name of your sweet and/or savory dish.

Drop off items in the Gatehouse, 2nd floor reception area. ■

### New Arrivals

#### Michael Choi

Michael Choi has joined the IGB Computer and Network Resource Group (CNRG). He will be providing desktop support as well as video production with the Communications group.

#### Bemi Ekwejunor

Bemi Ekwejunor also joins CNRG, as a Research Programmer. He will be providing desktop support to members of the IGB, as well as working on special projects within the CNRG group.

#### Kathryn Coulter

Kathryn Coulter officially joined the IGB Communications group in November 2011 as a Multimedia Design Specialist. She lends her photography, videography and design experience to IGB projects.

#### Mirhee Lee

Mirhee Lee has joined the IGB Communications group as a Senior Graphic Design Specialist. She brings print and web design experience for work on Energy Biosciences Institute (EBI) and IGB projects.

#### Jackie Newman

Jackie Newman has joined the IGB business office as a Grants and Contracts Specialist. She will assist with grant processing and management. ■

## {Around the IGB}

### Farewell

#### Tim Kerestes Retires



After decades of service to the University of Illinois, IGB Director of Operations and Facilities, Tim Kerestes has retired.

A graduate of the University of Illinois at Urbana-Champaign architecture program, Kerestes spent a majority of his professional career contributing to the Urbana campus, working on projects such as the library for the College of Agriculture,

Consumer and Environmental Sciences, the Grainger Engineering Library, the Chemical and Life Sciences laboratory, and the Beckman Institute for Advanced Science and Technology.

He provided exceptional project management for the construction of the IGB, bringing the final project cost several million dollars below budget because of his unwavering dedication and outstanding work ethic. The IGB community owes him a great debt of gratitude, and congratulates him on his successful retirement and well-deserved break. ■

### SoyFACE

#### New Website Launched



SoyFACE (Soybean Free Air Concentration Enrichment) is an innovative facility for growing crops under production field conditions in an atmosphere that has higher levels of carbon dioxide and

ozone, higher temperature and altered soil water availability. Visit their newly redesigned site at <http://www.igb.illinois.edu/soyface/> ■

## ADMINISTRATIVE NEWS

## {Biotechnology Information Center }

### Resources Update



#### Find Online Journals & Databases

**ORR (Online Research Resources)**, [www.library.illinois.edu/orr/](http://www.library.illinois.edu/orr/), is no longer being updated and will be discontinued after the Spring semester. In its place, please use the *Find Journals and Databases* (J&D) resource, [openurl.library.uiuc.edu/sfx/c3/az](http://openurl.library.uiuc.edu/sfx/c3/az). Use the J&D to determine if we have electronic access to particular journals or databases.

**Scientific American.** We recently acquired electronic access to the full run of *Scientific American* and *Scientific American Mind* from Nature. Please use the J&D (above) for the link.

**OpenHelix.** Based on feedback from the research community at the U of I, we now subscribe to *OpenHelix*. Here you will find tutorials, teaching aids, and other guides for bioinformatics and genomics tools. Tell your students about this resource! Please use the J&D (above) for the link.

**JoVE.** We now have electronic access to all sections of the *Journal of Visualized Experiments* (JoVE), including Neuroscience, Immunology & Infection, Clinical & Translational Medicine, Bioengineering, and Basic Protocols. Please use the J&D (above) for the link to JoVE.

**Faculty of 1000.** The **Faculty of 1000 (F1000)** site now includes reviews on articles in both biology and medicine. In addition to evaluated articles you will find two new open access journals, *F1000 Reports Biology* and *F1000 Reports Medicine*. Please use the J&D (above) for the link to *Faculty of 1000*.

**Global Health.** Recently we added a subscription for *Global Health* to our CAB Abstracts account. Use Global Health to augment your Medline (PubMed) searches with a more universal outlook, including citations from developing countries. Please use the J&D (above) for the link to CAB Abstracts and *Global Health*.

**BIOSIS Citation Index.** We recently upgraded our subscription for Biological Abstracts to BIOSIS Citation Index. Unlike Biological Abstracts, BIOSIS Citation Index includes review journals and scientific meetings. And, like Web of Science, also includes citations to cited references. Find a link to Biosis Citation Index in the J&D (above).

**Tip:** Search "Web of Knowledge" (all databases) to search simultaneously Web of Science, BIOSIS Citation Index, CAB Abstracts & Global Health, Medline, Food Science & Technology Abstracts, and Zoological Abstracts. Find a link to Web of Knowledge in the J&D (above). ■

## {CNRG}

### Rolling Network Outages on February 18

In preparation for the campus unified communication transition, IGB and CITES staff need to make modifications to our respective networking equipment in the IGB on February 18 starting at 6:00 AM. These modifications should cause approximately two fifteen minute network outages that will take place slowly over the building during the day. Our expectation is to complete all work by 4:00 PM.

If you have any questions or concerns, please contact Daniel Davidson, Director of CNRG, at [danield@igb.uiuc.edu](mailto:danield@igb.uiuc.edu). ■



## {Operations and Facilities}

### IGB Security Reminders

Please be reminded to take extra care when entering the IGB both via the exterior doors during off-hours and doors leading into secured spaces within the IGB at any time.

Do not let unknown people into the IGB or secured spaces. Anyone needing access should be directed to Operations and Facilities for prox card or key access permissions.

Be aware of people loitering around the doors and grabbing the door before it closes behind you to gain access.

Absolutely NO doors should be propped open—this compromises IGB security.

We should all be observant of our surroundings and report any suspicious behavior immediately by calling 9-911 from a Campus phone.

The University of Illinois Public Safety website (<http://www.dps.uiuc.edu/>) has helpful information regarding personal safety, as well as other topics of interest.

<http://dps.illinois.edu/emergencyplanning/emergencyproceduresposter.pdf>

IGB Operations and Facilities: [facilities@igb.uiuc.edu](mailto:facilities@igb.uiuc.edu), 244-2999 ■



## {Communications}

### Research Imagery



The communications group is always looking to expand our library of images relating to research taking place at the IGB. If you or your team would like to have your work photographed for use on the website or in our publications, please contact Nicholas Vasi at [nvasi@illinois.edu](mailto:nvasi@illinois.edu). ■

## {Business}

### Renewal of IGB Standing or Annual Purchase Orders For FY13

February is the month in which University Departments are allowed to begin processing requisitions to renew standing or annual purchase orders for the next Fiscal Year.

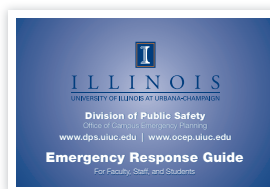
If you have an existing FY12 equipment maintenance contract through the IGB that needs to be renewed for FY13, i.e. 7/1/12 - 6/30/13, please e-mail Pamela Rank a copy of the quote from the vendor along with the CFOP # that you would like to charge.

If you have an existing FY12 standing order for supplies or services through the IGB that needs to be renewed for FY13, i.e. 7/1/12 - 6/30/13, please email Pamela Rank to inform her of the CFOP # to be charged and the Purchase Order amount for FY13.

If you have any questions regarding the renewal of standing or annual purchase orders through the IGB for FY13, please contact Pamela Rank at 244-8959 or via email at [rank@illinois.edu](mailto:rank@illinois.edu). ■

## {Safety}

### Emergency Response Guides



The Safety office will be distributing Emergency Response Guides to all themes and administrative areas throughout the IGB. These guides are provided by the University Division of Public Safety to assist employees students and staff with a quick reference guide on how to respond to various emergency situations. The guides should be placed in an area where all of the personnel within your group have access to it, ideally located in a central location with quick access to a departmental phone. ■