



IGB NEWS

Achievements, awards, and information about the IGB community

Volume 5, Number 8



Featured News

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Upcoming Events

iGEM Recruiting Info Session

January 17, 2013
 5:30 p.m. — 6:30 p.m.
 612 Institute for Genomic Biology

Undergrads from any major interested in learning more or joining the 2013 iGEM team are welcome.

IGB Seminar

January 29, 2013
 12:00 p.m.
 612 Institute for Genomic Biology

Andrew Feinberg, MD, MPH
Daniel Coit Gilman Scholar
Professor, Medicine, Molecular Biology, Biostatistics, Oncology
Director, Center for Epigenetics, Johns Hopkins University

"Title to be announced"

Bake-off and Culinary Competition

February 25, 2013
 4:00 p.m.
 IGB Concourse Level

Save the date for our next culinary competition!

Innovation and Commercialization Seminar

February 5, 2013
 12:00 p.m.
 612 Institute for Genomic Biology

Delphine Kranz
Associate Director, Office of Technology Management
 Svetlana Sowers
Technology Manager, Office of Technology Management

"Open Source Licensing"

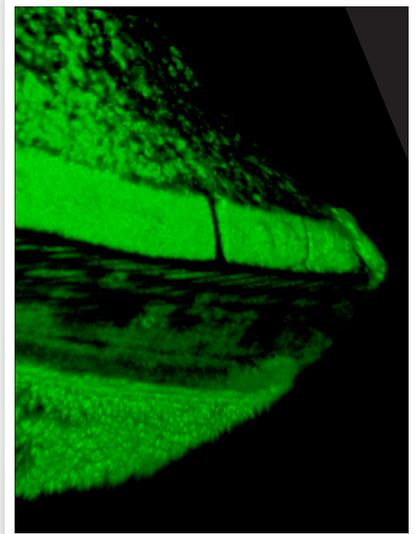
Harris A. Lewin Pioneer in Genomic Biology Distinguished Lecture

February 19, 2013
 12:00 p.m.
 612 Institute for Genomic Biology

Evan Eichler, PhD
Professor, Department of Genomic Sciences, University of Washington

"Title to be announced"

Image of the Month



This month's image shows the 3-dimensional structure of the tool tip of a tungsten carbide micro-drill that was labeled with Alexa Fluor 488, courtesy of James Zhu and Professor Shiv G. Kapoor, Mechanical Science and Engineering. This image was taken using the Zeiss LSM 700 confocal microscope.

IGB News

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

Illinois to Improve Crop Yield through Photosynthesis in New Global Effort

The University of Illinois at Urbana-Champaign has received a five-year, \$25-million grant from the Bill & Melinda Gates Foundation to improve the photosynthetic properties of key food crops, including rice and cassava. The project, titled "RIPE – Realizing Increased Photosynthetic Efficiency," has the potential to benefit farmers around the world by increasing productivity of staple food crops.



» Stephen Long (right), will serve as Project Director on a five-year, \$25-million grant from the Bill & Melinda Gates Foundation to improve the photosynthetic properties of key food crops, with Don Ort (left) serving as Associate Director. Illinois research will take place at the Institute for Genomic Biology.

Illinois research will take place at the Institute for Genomic Biology (IGB), a state-of-the-art facility whose large shared laboratories accommodate multiple groups and encourage cross-discipline interaction.

"This grant will be game changing," says Stephen Long, Project Director and Gutsell Endowed Professor of Crop Sciences and Plant Biology at Illinois. "This project represents a huge effort to determine and apply the mechanisms of photosynthesis that can contribute to the challenge of this century: food security for all."

Increasing photosynthetic efficiency has not yet been addressed by conventional breeding methods, though it has the potential to increase yields and reduce the use of water and nitrogen. Team

members will apply recent advances in photosynthesis research and crop bioengineering to the RIPE project. In addition, computer simulation models of the highly complex photosynthetic system, combined with practical engineering, will identify the best targets for improving photosynthesis efficiency.

"The UN Food and Agricultural Organization predicts that the world will need to increase staple crop yields 70% by 2050," says Long. "The rapid increases that were achieved during the Green Revolution have slowed and will not meet this target. Photosynthesis promises a new area, ripe for exploitation, that will provide part of the yield jump the world needs to maintain food security."

The University of Illinois, a pioneer in the impact

of global change factors on crop plants, will lead the study. The University is home to SoyFACE (Soybean Free Air Concentration Enrichment), an outdoor facility for growing crops under a variety of atmospheric climatic conditions that has shown strong evidence linking increased photosynthesis to consistently higher crop yields over the 10 years of its operation. Illinois is also home to the American Recovery and Reinvestment Act PETROSS program, which is engineering improved photosynthesis into two key US bioenergy crops, sugarcane and sorghum.

Don Ort, Associate Director of the project and Robert Emerson Professor of Plant Biology at Illinois and USDA–Agricultural Research Service Research Leader, states "Business as usual crop

“ The rapid increases that were achieved during the Green Revolution have slowed and will not meet this target. Photosynthesis promises a new area, ripe for exploitation, that will provide part of the yield jump the world needs to maintain food security. ”

development in the face of accelerating agricultural demand and the challenges of rapid global change will not get the job done. This award invests in unique strengths at Illinois as well as at our collaborating institutions and holds exceptional promise for broad impact outcomes." Ort leads the IGB research theme Genomic Ecology of Global Change.

"This grant reflects the historic excellence of photosynthesis research on this campus, and the cutting-edge approaches that have been developed for plant science at the IGB over the past few years by the members of the Genomic Ecology of Global Change and Energy Biosciences research themes," says IGB Director Gene Robinson.

Illinois will conduct the study through an international collaboration with other leading research institutions as sub-contractors of Illinois, which will initially include the Australian National University, Rothamsted Research (UK), University of Essex (UK), and USDA/ARS. ■

Cells Power Biological Machines: Researchers Use Cardiac Cells to Create “Bio-bots”

They’re soft, biocompatible, about 7 millimeters long—and, incredibly, able to walk by themselves. Miniature “bio-bots” developed at the University of Illinois are making tracks in synthetic biology.

Designing non-electronic biological machines has been a riddle that scientists at the interface of biology and engineering have struggled to solve. The walking bio-bots demonstrate the Illinois team’s ability to forward-engineer functional machines using only hydrogel, heart cells and a 3-D printer.

With an altered design, the bio-bots could be customized for specific applications in medicine, energy or the environment. The research team, led by professor Rashid Bashir, IGB affiliate in the Regenerative Biology & Tissue Engineering research theme, published its results in the journal *Scientific Reports*.

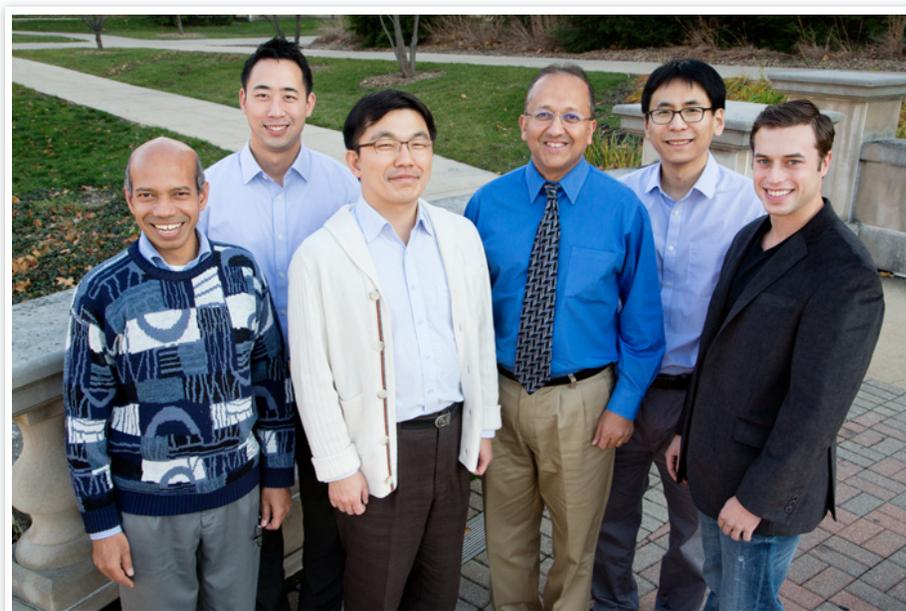
“The idea is that, by being able to design with biological structures, we can harness the power of cells and nature to address challenges facing society,” said Bashir, an Abel Bliss Professor of Engineering. “As engineers, we’ve always built things with hard materials, materials that are very predictable. Yet there are a lot of applications where nature solves a problem in such an elegant way. Can we replicate some of that if we can understand how to put things together with cells?”

The key to the bio-bots’ locomotion is asymmetry. Resembling a tiny springboard, each bot has one long, thin leg resting on a stout supporting

“ We have the design rules to make these millimeter-scale shapes and different physical architectures, which hasn’t been done with this level of control. What we want to do now is add more functionality to it. ”

leg. The thin leg is covered with rat cardiac cells. When the heart cells beat, the long leg pulses, propelling the bio-bot forward.

The team uses a 3-D printing method common in rapid prototyping to make the main body of the bot from hydrogel, a soft gelatin-like polymer.



» The team that developed the “bio-bots.” From left, Taher Saif, Vincent Chan, Hyunjoon Kong, Rashid Bashir, Kidong Park and Mitchell Collens.

This approach allowed the researchers to explore various conformations and adjust their design for maximum speed. The ease of quickly altering design also will allow them to build and test other configurations with an eye toward potential applications.

For example, Bashir envisions the bio-bots being used for drug screening or chemical analysis, since the bots’ motion can indicate how the cells are responding to the environment. By integrating cells that respond to certain stimuli, such as chemical gradients, the bio-bots could be used as sensors.

“Our goal is to see if we can get this thing to move toward chemical gradients, so we could eventually design something that can look for a specific toxin and then try to neutralize it,” said Bashir, who also is a professor of electrical and computer engineering, and of bioengineering.

“Now you can think about a sensor that’s moving and constantly sampling and doing something useful, in medicine and the environment. The applications could be many, depending on what cell types we use and where we want to go with it.”

Next, the team will work to enhance control and function, such as integrating neurons to direct motion or cells that respond to light. They are also working on creating robots of different shapes,

different numbers of legs, and robots that could climb slopes or steps.

“The idea here is that you can do it by forward-engineering,” said Bashir, who is the director of the Micro and Nanotechnology Laboratory. “We have the design rules to make these millimeter-scale shapes and different physical architectures, which hasn’t been done with this level of control. What we want to do now is add more functionality to it.”

“I think we are just beginning to scratch the surface in this regard,” said graduate student Vincent Chan, first author of the paper. “That is what’s so exciting about this technology – to be able to exploit some of nature’s unique capabilities and utilize it for other beneficial purposes or functions.”

The National Science Foundation supported this work through a Science and Technology Center (Emergent Behavior of Integrated Cellular Systems) grant. Graduate student Mitchell Collens, postdoctoral researcher Kidong Park, IGB Regenerative Biology & Tissue Engineering faculty member and chemical and biological engineering professor Hyunjoon Kong, and mechanical science and engineering professor Taher Saif were co-authors of the paper. Bashir also is affiliated with the Frederick Seitz Materials Research Laboratory. ■

Nominations are invited for the annual Innovation Celebration, held on February 28, 2013

Innovation Celebration is an annual event recognizing the entrepreneurial spirit in our community and on our campus. Awardees are recognized for contributions in a range of categories including economic impact, social entrepreneurship, student start-ups, and entrepreneur advocacy.

The Office of Technology Management is proud to partner with the organizers of Innovation Celebration to host two award categories specific to nominees from the University of Illinois.

Innovation Discovery: 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.

Innovation Transfer: Recognizes an individual

or group from the University of Illinois whose invention or work has been successfully transferred into the public sphere. Successful transfer includes a spectrum of activities ranging from forming a company to distributing the invention or idea free for the public good.

Nominations will be accepted through January 29, 2013. Nominators and nominees can be either faculty or students, and self-nominations are welcome. Nominate someone **via this link** today!

Save the Date:
Innovation Celebration
February 28, 2013
5:30 -8:00 p.m.
NCSA, 1205 West Clark, Urbana ■

Office of Technology Management's Internship Program

Applications are now being accepted for the Office of Technology Management's competitive internship program. Join us on at an info session to learn more about this exciting opportunity! Pizza will be provided.

Jan. 22 @ 12:00pm: Law School Rm A
Jan. 23 @ 11:30am: BIF Rm 3041
Jan. 23 @ 5:00pm: Noyes Rm 161
Jan. 24 @ 12:00pm: RAL Rm 117

Learn how interns assist in the evaluation, marketing, and licensing of cutting edge technology developed at the University.

More information about the program can be found at <http://otm.illinois.edu/2013interns> ■

Around the IGB

Awards

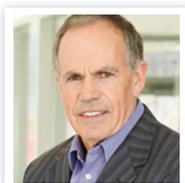
Genome Technology Young Investigators



Doug Mitchell was named one of Genome Technology magazine's Seventh Annual Young Investigators for his work in toxin biosynthesis and on "understanding

its mechanistic enzymology, and then devising a strategy to disrupt it." The Mitchell lab is using a genome mining and reconstitution approach to identify compounds and agents that are selective for these pathogenic mechanisms. The goal is to develop new targets to create drugs that do not kill pathogens, but disrupt their ability to produce toxins, all without affecting the beneficial microbes in the body. ■

Marsh Award for Climate Change Research



Stephen Long has received the Marsh Award for Climate Change Research by the British Ecological Society, an annual award recognizing outstanding contributions

to climate change research. Open to ecologists from anywhere in the world, Long will receive the award at the institute's annual meeting at the University of Birmingham in December. ■

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. Commemorate a special event, like graduation.

Deadline to have a paver installed for Spring 2013 graduation is Friday, March 8, 2013.

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

Competition

Holiday Lunch and Theme Competition

498 items were collected at the Holiday Lunch! Thank you to everyone who supported Toys for Tots and the Eastern Illinois Food Bank. Kudos to the volunteers who organized the theme competition.

Winners of the theme competitions are:

- 1st Place:** EBI
- 2nd Place:** Admin
- 3rd Place:** GBB and ReBTE ■

CEM

Science Skills. Business Savvy.

The Certificate in Entrepreneurship and Management (CEM) is a program for entrepreneurially minded MD, DVM, and PhD students, and postdoctoral associates in engineering, life sciences, and related disciplines who are interested in understanding the business, economic, and legal issues in scientific and high technical start-up ventures.

Students can enroll in the full academic program or only the Kauffman FastTrac Tech Venture Course program, completion of which offers possible internships. To learn more about the program or to complete the application, visit <http://www.igb.illinois.edu/cem/> ■

Workshop

Mayo-Illinois Alliance Pharmacogenomics Workshop

Save the date - on January 23, 2013 the Mayo Clinic-University of Illinois Strategic Alliance for Technology Based Healthcare will hold an upcoming workshop in 612 IGB.

Meet clinicians and researchers from the Mayo Clinic, learn more about programs and resources available for pharmacogenomics research, and engage in program planning for funding through the Mayo Alliance.

Go to mayoillinois.org for more information. ■

iGEM

iGEM Team Update and Recruiting Info Session



This year's undergraduate synthetic biology team earned one of the silver medals in the regional Americas East competition in Pittsburgh, PA.

The Illinois iGEM Team also advanced to the international competition in Cambridge, MA and presented its project to a global audience. The overall goal of the wet lab project was to create an *in vivo* enzymatic assembly line for production of piceatannol using the human pum1 gene (PUF) and an RNA scaffold. The entrepreneurship team

presented a business model for marketing the wet lab project.

Undergrads from any major interested in joining the 2013 team should contact Courtney Fuentes Evans at cfevans@illinois.edu and/or attend the information session on Thursday, Jan. 17 from 5:30 to 6:30pm in 612 IGB. ■

New Arrivals

Rachel Smith-Bolton



Professor Rachel Smith-Bolton has joined the IGB as an affiliate in the Regenerative Biology and Tissue Engineering Research Theme. Professor Smith-Bolton is an As-

sistant Professor in the Department of Cell and Developmental Biology. She received her B.A. degree from Harvard University and her Ph.D. degree from Stanford University. ■

Susan Flanegin



Susan Flanegin has joined the IGB as an Office Manager supporting the Host Microbe Systems and Mining Microbial Genomes research themes. Before joining

the IGB, Susan was the Office Manager for the Center for the Physics of Living Cells (CPLC) in the Physics Department. Susan has been with the University for six years. ■

Amy Roberts



Amy Roberts joined IGB as Purchasing Officer II. She will be responsible for the ledger 3 accounts as well as department procurement. She has been with the University

for six years in the Purchasing Division, and is currently working on her BA from Eastern Illinois University. ■

ADMINISTRATIVE NEWS

University Library

ORCID (Open Researcher and Contributor ID)

You might be interested in ORCID, the Open Researcher and Contributor ID initiative, especially if you have a common name (like I do).

ORCID (about.orcid.org) provides individual researchers with a persistent digital identifier to distinguish your research from the research of others with similar names. The identifier can be attached to a variety of research outputs, such as datasets, articles, citations, and experiments.

To distinguish your research, ORCID outlines three steps:

1. Register on the ORCID website to receive your ORCID identifier
2. Enhance your ORCID record with professional information and links to other identifiers, such as LinkedIn
3. Include your ORCID identifier whenever possible (e.g., on your website, when you submit publications, when you apply for grants)

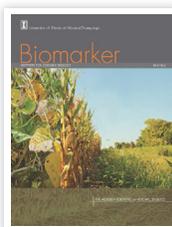
ORCID is an open, non-profit, international, community-based initiative with two main functions: (1) a registry to obtain a unique identifier to manage a record of research activities, and (2) APIs that support system-to-system communication and authentication.

ORCID was launched in October 2012, and within the first month, over 20,000 ORCID identifiers were issued.

If you have questions about ORCID or other research publication issues, feel free to contact me - Sarah Williams, Life Sciences Data Services Librarian, at scwillms@illinois.edu. ■

Communications

Biomarker Magazine



The latest issue of Biomarker, the IGB magazine, is available. Featuring coverage of the highlights of the last year, including our multi-institutional effort to develop drought resistant grasses for use in biofuels, our study that suggests personality traits are not limited to humans and other vertebrates, the discovery of speciating microbes in a hot spring, and more. Contact the communications group at nvasi@illinois.edu for printed copies, or [download a version here](#). ■

IGB Building Holiday Schedule Changes

- The IGB building will be closed December 24 thru January 1. This means that all exterior doors will be locked and all card access doors will require entry with a valid IGB prox card. Please take care when entering or leaving the IGB not to allow someone you do not recognize into the IGB.
- If you notice any urgent building issues (water leaks, CT room temperature problems, etc.) please call 333-0340 for the F&S Service Office. This number is answered by Public Safety during off-hours and they will be able to assist you. Emails sent to facilities@igb.uiuc.edu during this time will not be immediately addressed.
- IGB administrative offices will be closed December 24 thru January 1.
- IGB Shipping and Receiving will be closed December 24 thru January 1. No packages or mail will be received or sent during this time period. If you have any questions related to shipping, receiving, or mail, please contact IGB Shipping and Receiving (receiving@igb.uiuc.edu). If you have questions related to purchasing, please contact the Business Office (purchasing@igb.uiuc.edu).
- Array Cafe will be closed December 24 thru January 1.
- If you are in the building when it is closed, please turn off all lights when you leave your area.
- “No parking” areas are still enforced even when the building is closed.
- For the full list of seasonal announcements [click here](#).

Shipping & Receiving Shipout Hours

In order to have a package shipped out the same day, please see the guidelines below:

- FedEx Shipouts: Package with completed shipout form must be brought to Shipping and Receiving before 2:30 p.m.
- UPS Shipouts: Package with completed shipout form must be brought to Shipping and Receiving before 3:30 p.m. ■

Holiday Schedule/Reduced Service Days

As we approach the holiday season we are providing a reminder of the holiday schedule, which will be accompanied by a period of Reduced Service Days.

Employees have two floating holidays that can be used any time from July 1, 2012, until June 30, 2013. One or both floating holidays may be applied to the reduced service days. Employees should review their leave balances available for use during the reduced service days. Departments are strongly encouraged to begin planning for this period and to discuss these plans with their employees.

Reduced Service Days:

- It is expected that most units will be closed and most employees will not be working those three days.
- Employees may use floating holidays or vacation to cover this time if they do not work.
- In addition, non-exempt (eligible for overtime) employees may use accrued compensatory time or take the time excused without pay.
- Exempt employees who do not have accrued vacation or floating holidays to cover this time cannot have their pay docked. The unit may require such employees to work on the unit and the employee may make arrangements to account for the reduced service days in an alternative way.
- Since the reduced service days are not official holidays, employees who are required to work and those who choose to work will be paid their regular hourly rate of pay. For payroll time reporting purposes, non-exempt staff employees who work should record their time for these three days as regular hours. Exempt employees who are required to work on one or more of these days should not record anything for the days they work, since they record only “exception time” (e.g., vacation or sick leave usage).

Questions regarding reduced service days may be directed to Connie Foran, Labor and Employee Relations at 333-3105 or Yulee Kim, Academic Human Resources at 333-0033. ■

Safety

Personal Protective Equipment (PPE) and Lab Safety

Personal Protective Equipment (PPE), which is required by the IGB and provided by the Themes, and proper hygiene are basic aspects of laboratory safety. Following the best practices as described below will minimize exposure to hazardous materials during routine use or in the event of an accident.

Eating, Drinking, the Storage of Food for Human Consumption and the Application of Cosmetics are not allowed in IGB laboratories, including the desk areas within the theme labs. Human food storage must be separate from lab chemical, lab biological or radioactive material storage. Food for human consumption should also not be stored in the constant temperature rooms. Break rooms are provided on all floors with refrigerators suitable for storage of food and drinks.

Hand Washing: Hands should be washed frequently throughout the day, after glove removal, before leaving the lab, after contact with any hazardous material, and before eating, drinking, smoking, or applying cosmetics.

Attire: When a hazard exists researchers must wear a lab coat or apron, cover the legs (no shorts or skirts) and feet (no sandals or open-toed shoes), and

confine loose clothing and long hair. Nylons and/or pantyhose are not recommended because they may melt upon contact with acid, trapping the acid against the skin.

Eye Protection: It is state law and campus policy that personnel—including students, staff and visitors in laboratories—wear safety glasses, goggles, or face shields at all times where eye hazards are a possibility. Chemical splash goggles are recommended when chemical splashes are possible.

Contact Lenses: Contact lenses may be worn in the IGB laboratories; however, they do not provide any protection for the eyes. Persons who wear contacts must wear the same eye protective equipment as persons who do not wear contacts. It is advisable for a person wearing contacts to inform co-workers and advisors of the contacts, so that if there is an emergency situation involving chemicals and the eyes, potential emergency responders will know to remove the contacts.

Face Shields: Full-face shields must be worn when conducting a procedure which may result in a violent reaction.

Gloves: Gloves are essential when working with hazardous substances. The proper gloves will prevent skin absorption, infection or burns without signifi-

Safety

cantly affecting dexterity. Poor dexterity could increase the risk of chemical spills. Glove materials vary in effectiveness in protecting against chemical hazards, and gloves of the same material may differ in the time it takes for a chemical or solvent to pass through the gloves and in the volume of material that easily passes through the gloves. Consult a chemical resistance chart, ideally from the specific glove manufacturer, or contact Robert Mann for assistance in appropriate glove selection.

Respiratory Protection: Administrative controls (different materials or procedures) and engineering controls (chemical fume hoods, biological safety

cabinets and other ventilation strategies) are always preferable to protection by PPE. Work in a chemical fume hood when working with materials that produce hazardous vapors or fumes. If the use of a respirator is required for work that can not be performed in a chemical fume hood, compliance with the UIUC Respiratory Protection Program, administered by the F&S Division of Safety and Compliance, is required. The Respiratory Protection Program includes requirements for a medical assessment, fit testing and instructions on proper use of respirators. ■

Recent Publications

Agarwal V, Pierce E, McIntosh J, Schmidt EW, Nair SK. Structures of cyanobactin maturation enzymes define a family of transamidating proteases. *Chem Biol.* 2012;19(11):1411-1422.

Boyce WT, Sokolowski MB, Robinson GE. Toward a new biology of social adversity. *Proc Natl Acad Sci U S A.* 2012;109:17143-17148.

Clark LV, Evans KJ, Jasieniuk M. Origins and distribution of invasive *rubus fruticosus* L. agg. (rosaceae) clones in the western united states. *Biol Invasions.* 2012:1-12.

Drnevich J, Replogle KL, Lovell P, et al. Impact of experience-dependent and -independent factors on gene expression in songbird brain. *Proc Natl Acad Sci U S A.* 2012;109:17245-17252.

Groenen MAM, Archibald AL, Uenishi H, et al. Analyses of pig genomes provide insight into porcine demography and evolution. *Nature.* 2012;491(7424):393-398.

Kapheim KM, Smith AR, Nonacs P, Wcislo WT, Wayne RK. Foundress polyphenism and the origins of eusociality in a facultatively eusocial sweat bee, *megalopta genalis* (halictidae). *Behav Ecol Sociobiol.* 2012:1-10.

Oh EJ, Ha S-, Rin Kim S, et al. Enhanced xylitol production through simultaneous co-utilization of cellobiose and xylose by engineered *saccharomyces cerevisiae*. *Metab Eng.* 2012.

Sanogo YO, Band M, Blatti C, Sinha S, Bell AM. Transcriptional regulation of brain gene expression in response to a territorial intrusion. *Proceedings of the Royal Society B: Biological Sciences.* 2012;279(1749):4929-4938.



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