IGB NEWS

Volume 7, Number 5

IF YOU ARE NEW TO THE IGB THIS SEMESTER, WELCOME. IF YOU'VE BEEN AWAY FROM THE IGB FOR THE SUMMER, WELCOME BACK!

UPCOMING EVENTS

Center for Nutrition, Learning, and Memory Special Lecture

Leading the Nation's Health Initiatives through Disease Prevention and Health Promotion

September 24, 2014, 2:00 p.m.

Beckman Institute Auditorium
405 N. Mathews Ave

Don Wright, MD, MPH
Deputy Assistant Secretary for Health, U.S. Department of Health and Human Services
Director, Office of Disease Prevention and Health Promotion

IGB Seminar (GEGC)

The Genomic Ecology of Climate Relicts: Young Technologies and Old Populations as Tools for a New Trade

October 10, 2014, 12:00 p.m.

612 Institute for Genomic Biology

Scott Woolbright, PhD
University of Illinois
Institute for Genomic Biology

Genome Day

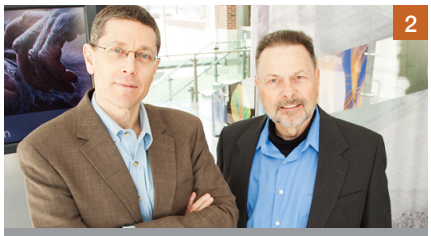
A day of DNA, genes, genomes, and evolution

November 1, 2014, 1:00 p.m.

Orpheum Children's Science Museum
346 North Neil Street, Champaign

Everyone is welcome for a free day of exhibits and activities designed to present the environment, energy use and production, health, and fundamental research at the IGB in an approachable manner for all ages.

FEATURED NEWS



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RFID Tags on Honey Bees Reveal Hive Dynamics

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New Research May Help Personalize Cancer Treatments

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Profile: Karen Sears

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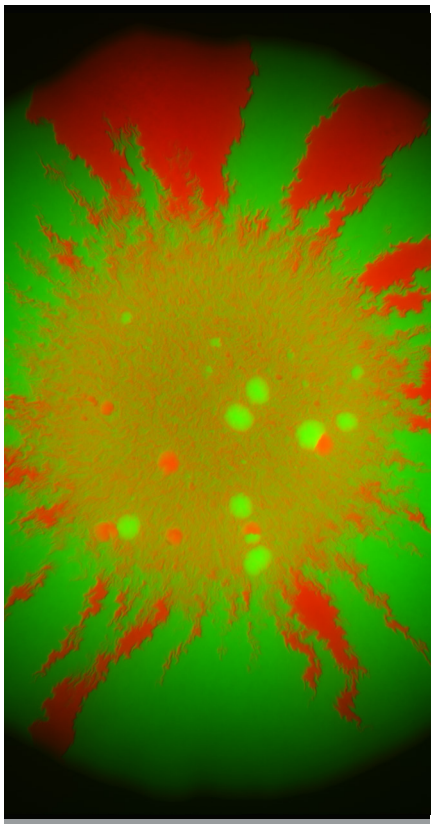
On the Grid: Happenings at IGB

IMAGE OF THE MONTH

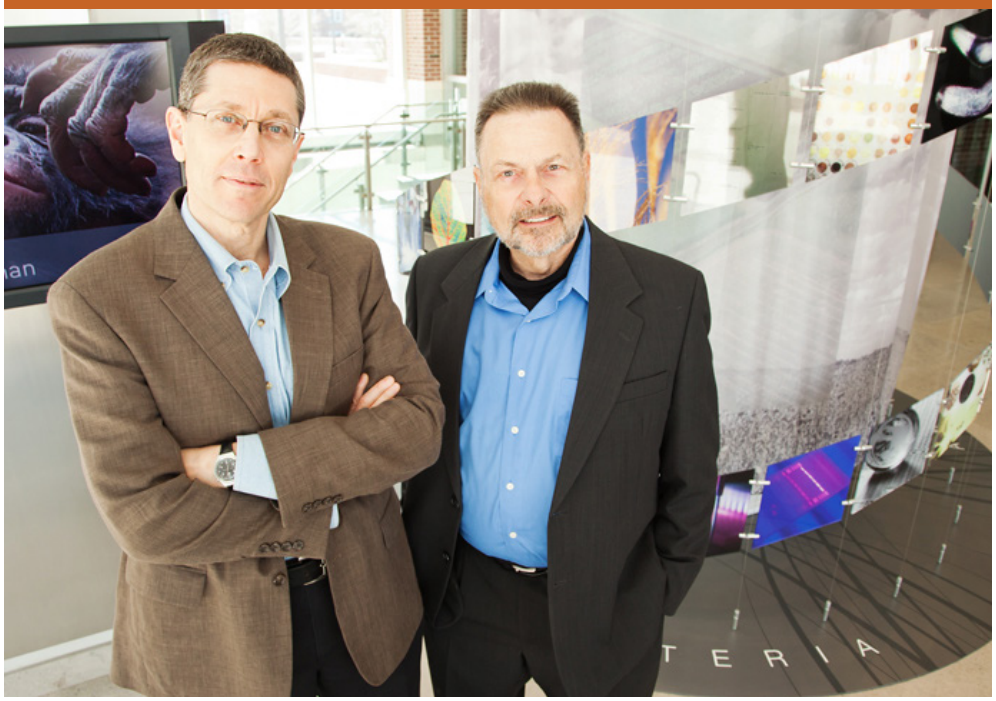


This month's image, "Expansion of Competing Bacteria," displays the spatial range expansion of two competing bacterial species. One species can be seen in green, and the other in red.

This image was captured with the Zeiss Stereolumar v12, and is provided courtesy of Venhar Celik of the Ting Lu Lab, in the Department of Bioengineering.

IGB News

Share your news with the IGB. Send ideas on stories, articles, and features to *nvasi@illinois.edu*.



Radio Frequency ID Tags
on Honey Bees Reveal Hive Dynamics

Scientists attached radio-frequency identification (RFID) tags to hundreds of individual honey bees and tracked them for several weeks. The effort yielded two discoveries: Some foraging bees are much busier than others; and if those busy bees disappear, others will take their place.

The findings are reported in the journal *Animal Behaviour*.

Tagging the bees revealed that about 20 percent of the foraging bees in a hive brought home more than half of the nectar and pollen gathered to feed the hive.

"We found that some bees are working very, very hard–as we would have expected," said Institute for Genomic Biology director Gene E. Robinson, who led the research. "But then we found some other bees that were not working as hard as the others."

Citizen scientist Paul Tenczar developed the technique for attaching RFID tags to bees and tracking their flight activity with monitors. He and Neuroscience Program graduate student Claudia Lutz measured the foraging activities of bees in several locations, including some in hives in a controlled foraging environment. (*Watch a video about this work.*) Vikyath Rao, a graduate student in the laboratory of U. of I. physics professor Nigel Goldenfeld, analyzed the data using a computer model Rao and Goldenfeld developed.

Previous studies, primarily in ants, have found that some social insects work much harder than others in the same colony, Robinson said.

"The assumption has always been that these 'elite' individuals are in some way intrinsically better, that they were born that way," he said.

While it is well known that genetic differences underlie differences in many types of behavior, the new findings show that "sometimes it is important to give individuals a chance in a different situation to truly find out how different they are from each other," Robinson said.

Removal of the elite bees "was associated with an almost five-fold increase in activity level in previously low-activity foragers," the researchers wrote. The change occurred within 24 hours, Tenczar said. This demonstrates that other individuals within the hive also have the capacity to become elites when necessary, Robinson said.

"It is still possible that there truly are elite bees that have some differential abilities to work harder than others, but it's a larger group than first estimated," Robinson said. "Or it could be that all bees are capable of working at this level and there's some kind of colony-level regulation that has some of them working really, really hard, making many trips while others make fewer trips."

Perhaps the less-busy bees function as a kind of reserve force that can kick into high gear if something happens to the super-foragers, Robinson said.

"Our observation is that the colony bounces back to a situation where some bees are very active and some are less active," he said. "Why is that? We don't know. Do all bees have that capability? We still don't know."

The National Science Foundation and the Christopher Family Foundation supported this research. ■

Written by Diana Yates. Photos by L. Brian Stauffer and Tom Newman of the Robinson Bee Laboratory.

The radio frequency identification (RFID) tag allowed researchers to determine that some foraging bees are much more active than others.

(top) Gene Robinson, left, with citizen scientist Paul Tenczar.

The Imoukhuede Systems Biology Laboratory includes (left to right) Ali Ansari, Jared Weddell, Wendy Woods, Spencer Mamer, and PI Princess Imoukhuede.

New Research May Help Doctors
Personalize Cancer Treatments

Most types of tumors, including cancer, require a supply of blood to grow larger than a few millimeters. Scientists have made great progress in combating cancer by finding effective ways to stop the formation of new blood vessels, called angiogenesis.

In four recent papers, University of Illinois Assistant Professor of Bioengineering Princess Imoukhuede and co-authors have made significant progress in personalizing angiogenesis inhibition cancer treatments.

Imoukhuede's lab is working to better understand the tumor microenvironment and why the same type of tumor may behave differently in people, like two mulberry trees reacting differently to the same herbicide.

"My lab is trying to understand whether there is a subset of patients for whom anti-angiogenic treatments are especially useful, and if so, find out how we identify those patients," said Imoukhuede, who is also an affiliate of the Institute for Genomic Biology. "That's where we get into the area of personalized medicine, being able to tailor anti-angiogenic treatments specifically to a patient."

The cells that make up tumors have different populations of receptors that promote blood vessel growth. Imoukhuede says these receptors can serve as biomarkers, helping doctors predict drug responsiveness by providing a quantitative way to profile cells.

"If there is a traffic jam and you block a freeway, you'll find that cars will go through some of the side streets. We can try to block some of those side streets, but cars will still try to find a way through," Imoukhuede said, describing the way anti-angiogenic drugs block receptors that encourage tumor growth. "This is the problem with cancer research, where you block one marker, receptor, or molecule, the tumor still finds another way."

For personalized cancer treatments to become a reality, Imoukhuede says scientists must understand the tumor microenvironment, find a way to count the number of receptors, then apply that data to computational models that predict cancer drug efficacy and suggest the best treatment options for each patient.

"This is the problem with cancer research, where you block one marker, receptor, or molecule, the tumor still finds another way."

"The most exciting take-home message is that we are able to find certain cells within the tumor microenvironment that we haven't profiled previously," Imoukhuede said. "We determined that a certain subset of these cells had very high levels of expression of one of these angiogenic receptors that could actually negate some of the effects of a common anti-angiogenic drug."

In a paper in *PLOS ONE*, Imoukhuede and co-authors used optical approaches that can be further developed to trap cancer cells so that they can count the receptors and profile the cells. In another paper, published in the *Journal of Materials Chemistry B*, Imoukhuede and other researchers began setting the calibration standards needed to quantitatively profile cancer cells. In a *Cancer Medicine* and *PLOS ONE* article on profiling and modeling, Imoukhuede and her colleagues reported that they have begun collecting data and creating computational models.

The anti-angiogenic cancer drug, Avastin, has already been developed and is approved for many types of cancer, including brain, lung, and colorectal cancer. However, the Food and Drug Administration revoked approval for metastatic breast cancer due to evidence that the survival benefits did not outweigh the side effects for many patients.

Imoukhuede's research may someday make these drugs available to a subset of metastatic breast cancer patients who might benefit more from the survival benefits than other metastatic breast cancer patients.

Imoukhuede's coauthors include: Felipe Lee-Montiel, a Postdoctoral Fellow in Bioengeering at Illinois; Aleksander Popel, a professor of biomedical engineering at Johns Hopkins University; Brian Roxworthy, currently an NRC Postdoctoral Fellow at the Center for Nanoscale Science and Technology; Michael Johnston, currently a systems engineer at Boeing; Randy Ewoldt, an assistant professor of mechanical science and engineering at Illinois; Kimani Toussaint Jr., an associate professor of electrical and computer engineering at Illinois; and Jared Weddell, a graduate student in bioengineering at Illinois.

The American Cancer Society, Illinois Division Basic Research Grant, National Institutes of Health, United Negro College Fund, Merck, and the Federation of American Societies for Experimental Biology supported Imoukhuede's work. ■

Written by Claire Sturgeon. Photo by Kathryn Coulter.

PROFILE

Karen Sears is an Assistant Professor, in the School of Integrative Biology, who focuses on developmental mechanisms that cause differences in the form and structure of organisms.

Karen Sears:
Looking at Life's Changes

When most five-year-olds dreamed of careers as superheroes and princesses, Karen Sears (GNDP) decided she wanted to be a paleoanthropologist.

"How life changes over time is something that has really always fascinated me," said Sears, an Assistant Professor in the School of Integrative Biology. "I always knew that I would pursue some aspect of that."

In graduate school, her adviser studied South American marsupial fossils from the Age of Mammals, an era that spans the past 66 million years. During this time, marsupial mammals have dominated South America while placental animals have dominated North and Central America.

"Why do we see that pattern? Why don't we see this pattern?" she asked herself. "Why is the world full of rats instead of opossums or these other forms? What is going on to shape the large scale patterns that we see?"

Sears realized that while paleontology could show *how* animals changed, she would need evolutionary developmental biology to explain *why*.

Today Sears combines her background in paleontology with her knowledge of genetics and development to study the processes that have shaped mammalian evolution.

"I feel like we are at the point in our lab right now where we can start bringing together all of these different fields, which historically have not been brought together," Sears said. "Now we can look at the fossil record of mammals and study how their genes interact throughout their development to cause them to have different kinds of limbs. We are also trying to understand how this process of development might be biasing, shaping, and constraining these patterns of evolution."

In the second episode of *Your Inner Fish*, a three-part PBS series that traces 350 million years of human evolution, Sears describes how two tiny bones disconnect from the jawbone, shrink, and move up to become middle ear bones as embryonic opossums mature into adults. She studies this developmental process to help her understand how mammals may have evolved middle ear bones from reptile jawbones.

"Now we can look at the fossil record of mammals and study how their genes interact throughout their development to cause them to have different kinds of limbs. We are also trying to understand how this process of development might be biasing, shaping, and constraining these patterns of evolution."

In addition to opossums, Sears works with bats, pigs, horses, camels, and any other specimens that she can get her hands on. For her, getting specimens is often the limiting factor in her research on organ development, digit reduction, and other topics in evolutionary developmental biology.

In the past year alone, Sears has visited Puerto Rico, Belize, and Trinidad to collect bat specimens.

"You have those moments when you are sitting there in the moonlight with your net, collecting your bats, beside a Mayan temple and you think, 'Wow. This is my life,'" she said. "This is what I get paid to do. It's pretty amazing."

Sears earned a bachelor's degree in anthropology and zoology from the University of Wisconsin–Madison and a doctorate in evolutionary biology from the University of Chicago. She was a postdoctoral researcher with professor Lee Niswander at Memorial Sloan Kettering Cancer Center and later at the University of Colorado. Sears is married to Jon Marcot, a research assistant professor at Illinois, and they have two children. ■

Written by Claire Sturgeon. Photo by Kathryn Coulter.

Your Inner Fish is a three-part PBS series based on a book by the show's host Neil Shubin, that traces 350 million years of human evolution.

In the second episode, Sears explains how some of the developmental processes of the opossum resemble the evolution of mammals' middle ear bones from reptile jawbones. As embryonic opossums mature into adults, two tiny bones will disconnect from their jawbone, shrink, and move up to become their middle ear bones.

ON THE GRID
HAPPENINGS AT THE IGB

AGRONOMY DAY

RIPE AND PETROSS PROJECTS

Two projects led by Steve Long, Gutgsell Endowed Professor of Crop Sciences and Plant Biology (GEGC, BSD) were on display at the University's Agronomy Day. Featuring both the Realizing Increased Photosynthetic Efficiency (RIPE) project with the Bill & Melinda Gates Foundation, and Plants Engineered to Replace Oil with Sugarcane and Sorghum (PETROSS), funded by the Advanced Research Projects Agency - Energy (ARPA-E), the display contained valuable information and infographics.

View the display **here**.

GIVING

WALK OF LIFE

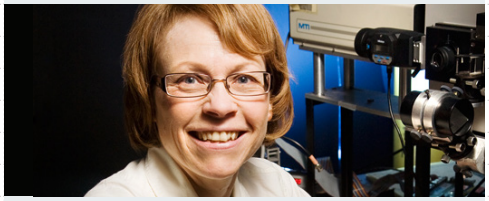
Located to the west of the IGB building, adjacent to the historic Morrow Plots, the Walk of Life pays tribute to the historical discoveries that enable our work on the cutting edge of genomic research. Contributing to the Walk of Life is a unique opportunity to simultaneously support our mission and become a permanent part of IGB history.

More information can be found at
www.igb.illinois.edu/about/giving

AWARDS

STEPHEN BOPPART
MARTHA GILLETTE

Stephen Boppart, Abel Bliss Professor of Engineering (ReBTE) and Martha Gillette, Professor of Cell and Developmental Biology (GNDP), were among the researchers to receive one of the 36 Early Concept Grants for Exploratory Research (EAGER) announced by the National Science Foundation.



DEBORAH LECKBAND

Deborah Leckband, Reid T. Milner Professor of chemical and biomolecular engineering (ReBTE), has been elected a 2014 fellow of the Biomedical Engineering Society.

BRIAN CUNNINGHAM

Brian Cunningham, professor of Bioengineering and of Electrical and Computer Engineering (MMG), has received a Technical Achievement Award from the Institute of Electrical and Electronics Engineers' Engineering in Medicine and Biology Society.

BRUCE FOUKE

Bruce Fouke, Professor, Departments of Geology and Microbiology (BCXT) has been chosen to serve as a 2014/2015 American Association of Petroleum Geologists (AAPG) Roy Huffington Distinguished Lecturer in the Asia/Pacific Region.

GENOME DAY

VOLUNTEERS NEEDED

The third annual Genome Day will be Saturday, Nov. 1 from 1:00-5:00pm at the Orpheum Children's Science Museum. To volunteer, please contact your theme's fellow or sign up **here**.

IGB WELLNESS

BLOOD DRIVE

The IGB Wellness Committee is sponsoring a Blood Drive in IGB 612 on Wednesday, October 15 starting at 8:30. Coffee and bite-size snacks will be provided courtesy of Array Cafe.

ON THE GRID
HAPPENINGS AT THE IGB

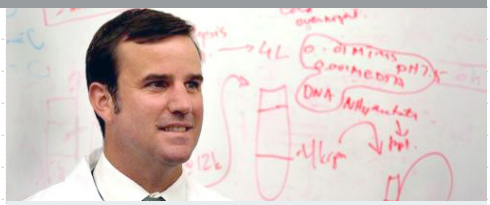
NEW ARRIVALS

ARON BARBEY

Professor Aron Barbey joins as an affiliate in GNDP. Professor Barbey is an Assistant Professor in the Department of Speech and Hearing Science. He received his Ph.D. in Psychology from Emory University in 2007, and completed a research fellowship in Cognitive Neuroscience at the National Institutes of Health in 2011. His current research investigates the principles of brain organization that underlie executive control, reasoning, and decision making.

TANDY WARNOW

Professor Tandy Warnow joins as BCXT faculty. Professor Warnow is a Founder Professor in the Departments of Bioengineering and Computer Science, previously from Computer Science at the University of Texas at Austin. Her research combines mathematics, computer science, probability and statistics, in order to develop algorithms with improved accuracy for large-scale and complex estimation problems in phylogenomics and metagenomics.



DEREK WILDMAN

Professor Derek Wildman joins as the founding theme leader of the new Computational Genomic Medicine Research Theme. Professor Wildman is also a Professor in the Department of Molecular and Integrative Physiology, previously from the School of Medicine at Wayne State University. His research focuses on using molecular evolutionary and comparative genomic approaches to understand genetic change during human evolution.

SARA HAAG

Sara Haag joins as the IGB Coordinator of Outreach Activities. She received her B.S. in Animal Sciences from the University of Illinois in 2011. As an undergraduate, she worked as a lab assistant at IGB in the lab of Professor Larry Schook. Sara completed her M.S. in Agricultural Education from the University of Illinois in 2013. She coordinates various activities related to outreach and public engagement for the IGB.

CHRIS MILLER

Chris Miller joins as the Facilities Manager for the IGB. Chris began his career at the University of Illinois in the early 90's in the Office of Admissions & Records. He later joined the College of Veterinary Medicine in 2005.

IP @ IGB

RECENT DEVELOPMENTS IN U.S. COURTS HAVE THROWN NATURAL PRODUCT PATENTS INTO QUESTION

In a 9–0 decision issued on June 12, 2013, the Supreme Court of the United States brought to a conclusion the closely watched case of *AMP et al. v. Myriad Genetics, Inc., et al.* The Court held that naturally-occurring gene sequences are not patent-eligible because they do not constitute "new matter." This holding did not establish a categorical ban on all products relating to DNA and natural products. Complementary DNA (cDNA) remains patent-eligible because the process of removing non-coding segments from a DNA sequence is considered to be an inventive act. DNA sequences not withstanding, there remains a wide range of biologically-sourced material that can be patented, including but not limited to constructs, vectors, transformants, and diagnostics.

At the center of the *Myriad* case were patent claims relating to what are now known as the BRCA1 and BRCA2 genes. Mutations in these genes can dramatically increase an individual's risk of developing breast and ovarian cancer. Myriad Genetics, Inc. (Myriad) discovered the precise location and sequence of BRCA and the company obtained patents that gave it exclusive control over diagnostic testing and scientific research relating to the genes. The Supreme Court invalidated Myriad's patents, holding that isolated genes are products of nature and are therefore precluded under §101 of the Patent Act.

While the *Myriad* decision was narrowly focused, the US Patent Office (USPTO) is applying the court's holding broadly. All natural product claims, not just those based on DNA, are being strictly scrutinized. The USPTO has advised that natural product derivatives are patentable so long as they are "significantly different" from the compounds found in nature. The office further clarifies that "not every change to a natural product will result in a marked difference, and the mere recitation of particular words in the claims does not automatically confer eligibility." Officials have not, however, indicated precisely what they consider to be the threshold for "significantly different."

The University's Office of Technology Management is working with skilled patent agents and attorneys to navigate these developments in the patent office. While the USPTO has elevated the requirements for natural product patents, the door remains open to patent a wide variety of University of Illinois natural product research.

ADMINISTRATIVE NEWS

BUSINESS

BUSINESS MEALS FOR EMPLOYEES AND GUESTS

Allowable for:

Recruitment - Meals or refreshments provided during meetings with non-employees or potential students, related to their possible employment at or admission to the University.

Business Meetings - University business discussions held between one or more University employees AND one or more visitors from an outside entity.

Hospitality Events - An event honoring distinguished guests who are not University employees. May include meals or receptions for faculty from other universities, members of external organizations, and/or visiting dignitaries. Dignitaries typically visit at the invitation of the University to participate in seminars, speaking engagements, and related events.

Amount Limits

Breakfast - $25 per person
Lunch - $40 per person
Dinner - $60 per person
Refreshments and Reception - $25 per person
Alcohol - $20 per person

Allowable Fund Types

State (for business meetings and recruitment only); gift, institutional, service plan, or self-supporting if the event is directly related to generation of the funds revenue. Convocation or graduation events may be funded by the Chancellor's or President's Public Function funds.

How to Purchase

Do NOT purchase business meals with a University P-Card. Make the purchase using:

- T-Card
- Purchase Order
- Reimbursed personal funds – Consult Request Reimbursement for Domestic or International Employee Travel and Business Meals ■

COMMUNICATIONS

IGB ANNUAL REPORT AVAILABLE

Looking for a copy of the newest IGB Annual Report? Download a version from *http://bit.ly/1hR469R*, stop by the IGB Communications office, send an email to info-igb@illinois.edu, or just drop us a note on any of our social media sites. We'll be happy to send you one. ■

UNIVERSITY LIBRARY

ANNOUNCEMENTS

The University Library wants to spread-the-word about funding and workshop opportunities that might be of interest to IGB researchers:

Apply for Funds to Purchase Datasets

The Library's Data Purchase Program allows campus researchers to apply for funds ($5,000 or less) to acquire data for their research. Details are at *http://go.library.illinois.edu/data*, including a full announcement that links to the application form. Applications can be submitted at any time, but the deadline for first consideration is September 29, 2014. Purchases from this first round of applications will be announced before December 1 and most data can be purchased by the middle of spring semester.

Workshops to Improve Research and Information Management Skills

The Library has released the Savvy Researcher Workshop schedule for fall 2014 (*http://illinois.edu/calendar/list/4068*). The free workshops are usually 50 minutes and cover a variety of tools and topics to improve research and information management skills. Below are some of the sessions that might be of particular interest to researchers in IGB, but be sure to look at the online schedule for a complete list of sessions, with details and registration links.

- Intro to Data Management and Publication
- Getting organized with Mendeley
- Organize Your Life!: Productivity Tools and Personal Information Management
- Metadata for Research Data: How to Understand Your Data and Find It Later
- Create and Manage an Online Scholarly Presence
- Getting the Most from PubMed for Health and Biomedical Research
- ArcGIS Online: GIS for Everyone ■

OPERATIONS & FACILITIES

ARRAY CAFE

Based on your feedback, important changes have come to the Array Café starting this semester:

- **Longer hours.** We're pleased to announce that the Café is now open from 8:00 am to 5:00 pm, Monday through Friday.
- **Reduced prices**. Check out the new Array menu to see the changes—Even token prices are lower!
- **New items.** We now offer vegetarian, vegan, and gluten-free options for many of our wraps and salads
- **Array Coffee!** New Array Blend coffee from Columbia Street Roaster

Check out the entire menu in the Café or **online**. While you're there, keep filling out the short survey – we value your input!
http://www.igb.illinois.edu/content/array-cafe-survey ■

RECENT PUBLICATIONS

Babbitt SE, San Francisco B, Bretsnyder EC, Kranz RG. Conserved residues of the human mitochondrial holocytochrome c synthase mediate interactions with heme. *Biochemistry*. 2014;53(32):5261-5271.

Bauweraerts I, Ameye M, Wertin TM, McGuire MA, Teskey RO, Steppe K. Acclimation effects of heat waves and elevated [CO2] on gas exchange and chlorophyll fluorescence of northern red oak (*quercus rubra L.*) seedlings. *Plant Ecol*. 2014;215(7):733-746.

Dunbar KL, Chekan JR, Cox CL, Burkhart BJ, Nair SK, Mitchell DA. Discovery of a new ATP-binding motif involved in peptidic azoline biosynthesis. *Nat Chem Biol*. 2014.

Rosenthal DM, Ruiz-Vera UM, Siebers MH, Gray SB, Bernacchi CJ, Ort DR. Biochemical acclimation, stomatal limitation and precipitation patterns underlie decreases in photosynthetic stimulation of soybean (glycine max) at elevated [CO2] and temperatures under fully open air field conditions. *Plant Sci*. 2014;226:136-146.

Worley KC, Warren WC, Rogers J, et al. The common marmoset genome provides insight into primate biology and evolution. *Nat Genet*. 2014;46(8):850-857.

Sun J, Feng Z, Leakey ADB, Zhu X, Bernacchi CJ, Ort DR. Inconsistency of mesophyll conductance estimate causes the inconsistency for the estimates of maximum rate of rubisco carboxylation among the linear, rectangular and non-rectangular hyperbola biochemical models of leaf photosynthesis-A case study of CO2 enrichment and leaf aging effects in soybean. *Plant Sci*. 2014;226:49-60.

Gust KA, Najar FZ, Habib T, et al. Coral-zooxanthellae meta-transcriptomics reveals integrated response to pollutant stress. *BMC Genomics*. 2014;15:591-2164-15-591.

Tan Y, Tajik A, Chen J, et al. Matrix softness regulates plasticity of tumour-repopulating cells via H3K9 demethylation and Sox2 expression. *Nat Commun*. 2014;5:4619.

Banks JM, Mozdzen LC, Harley BA, Bailey RC. The combined effects of matrix stiffness and growth factor immobilization on the bioactivity and differentiation capabilities of adipose-derived stem cells. *Biomaterials*. 2014;35(32):8951-8959.

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Alsop AT, Pence JC, Weisgerber DW, Harley BAC, Bailey RC. Photopatterning of vascular endothelial growth factor within collagen-glycosaminoglycan scaffolds can induce a spatially confined response in human umbilical vein endothelial cells. *Acta Biomater*. 2014.

Eshraghi A, Dixon SD, Tamilselvam B, et al. Cytolethal distending toxins require components of the ER-associated degradation pathway for host cell entry. *PLoS Pathog*. 2014;10(7).

Blatti C, Sinha S. Motif enrichment tool. *Nucleic Acids Res*. 2014;42(W1):W20-W25.

Kennett DJ, Asmerom Y, Kemp BM, et al. Early americans: Misstated results. *Science*. 2014;345(6195):390.

Chemla YR, Ha T. Ultraslow relaxation of confined DNA. *Science*. 2014;345(6195):380-381.

Tefsen B, Grijpstra J, Ordonez S, Lammers M, van Die I, De Cock H. Deletion of the CAP10 gene of *cryptococcus neoformans* results in a pleiotropic phenotype with changes in expression of virulence factors. *Res Microbiol*. 2014;165(6):399-410.

Piao H, Lachman M, Malfatti S, et al. Temporal dynamics of fibrolytic and methanogenic rumen microorganisms during *in situ* incubation of switchgrass determined by 16s rRNA gene profiling. *Front Microbiol*. 2014;5(JULY).

Pence JC, Gonnerman EA, Bailey RC, Harley BAC. Strategies to balance covalent and non-covalent biomolecule attachment within collagen-GAG biomaterials. *Biomater Sci*. 2014;2(9):1296-1304.

Kong W, Lu T. Cloning and optimization of a nisin biosynthesis pathway for bacteriocin harvest. *ACS Synth Biol*. 2014;3(7):439-445.

Wheeler MM, Robinson GE. Diet-dependent gene expression in honey bees: Honey vs. sucrose or high fructose corn syrup. *Sci Rep*. 2014;4.

Shen W, Wolf PG, Carbonero F, et al. Intestinal and systemic inflammatory responses are positively associated with sulfidogenic bacteria abundance in high-fat-fed male C57BL/6J mice. *J Nutr*. 2014;144(8):1181-1187. ■

ILLINOIS

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Contact Nicholas Vasi (nvasi@illinois.edu)
www.igb.illinois.edu 14.094