IGBNEWS
Achievements, awards, and information about the IGB community
Volume 4, Number 5

{Upcoming Events}

IGB Halloween Party
October 21, 2011
4:00 p.m.
Array Cafe

Pioneers in Genomic Biology Lecture Series
October 25, 2011
12:00 p.m.
612 Institute for Genomic Biology

Vickie L. Chandler, PhD
Chief Program Officer—Science
Gordon and Betty Moore Foundation, Palo Alto, CA

"Paramutation: Epigenetic Silencing Across Generations"

IGB Seminar
November 1, 2011
12:00 p.m.
612 Institute for Genomic Biology

Valerie M. Weaver, PhD
Associate Professor, Departments of Surgery and Bioengineering and Therapeutics
Director, Center for Bioengineering and Tissue Regeneration, University of California—San Francisco

"Tensional Homeostasis and the Malignant Phenotype"

Donut Day
November 4, 2011
8:30 a.m.
Array Cafe

Pioneers in Genomic Biology Lecture Series
November 15, 2011
12:00 p.m.
612 Institute for Genomic Biology

Michael Snyder, PhD
Professor and Chair of Genetics
Director, Stanford Center for Genomics and Personalized Medicine, Stanford University, Stanford, CA

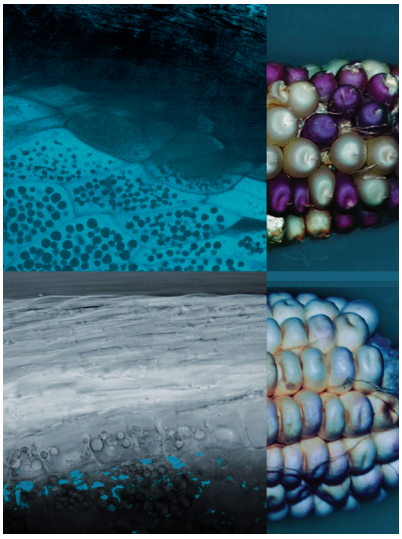
"Adventures in Personal Genomics and Whole Omics Profiling"

Pioneers in Genomic Biology Lecture Series
November 29, 2011
12:00 p.m.
612 Institute for Genomic Biology

Sarah Highlander, PhD
Associate Professor, Department of Molecular Virology and Microbiology
Baylor College of Medicine, Houston, TX

"Microbial Genomes for Metagenomics"

{Image of the Month}



This month's image, "Protein Body Formation in IHP and ILP," was made by Christine Lucas in the Stephen Moose Lab. The images were taken using the Canon EOS 5D Mark II and a Zeiss LSM 710 confocal microscope.

IGB News

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

Conference Focuses on Future of Biomass and Alternative Energy Crops

Academics, governmental officials and industry professionals gathered from across the globe to exchange ideas and collaborate on the development of bioenergy feedstocks such as Miscanthus x giganteus and switchgrass for competitive market use, as well as discussed bioenergy research and production.

›› Dr. Steven E. Koonin
Under Secretary for Science, U.S. Department of Energy

Sponsored by the Association of Applied Biologists (AAB) in the United Kingdom, the Energy Biosciences Institute and the University of Illinois at Urbana-Champaign, the three-day conference, "Biomass and Energy Crops IV," took place at the University of Illinois at Urbana-Champaign Sept. 21-23. This was the first time the conference has been conducted in the United States. This conference—the fourth hosted by the AAB—focuses on biomass and energy crops and works to develop a greater understanding of the potential of energy crops and how to effectively use biomass as one means of reducing dependence on fossil fuels.

Tom Voigt, EBI faculty and an associate professor at Illinois, and Trevor Hocking, AAB president, welcomed the conference attendees and introduced the keynote speaker, Dr. Steven E. Koonin.

Koonin, who is the Under Secretary for Science in the U.S. Department of Energy, was a chief scientist at BP between 2004 and 2009, where he developed the long-range technology strategy for alternative and renewable energy sources. He also played a central role in establishing the Energy Biosciences Institute at the University of Illinois at Urbana-Champaign, the University of California Berkeley, and the Lawrence Berkeley National Laboratory. His 29-year career at the California Institute of Technology was spent as a theoretical physics professor and later as provost, from 1995-2004.

He spoke about "Biology's role in addressing America's energy challenges," as well as strategies for the United States but also showed how those apply to Europe and the United Kingdom.

He explained that the U.S. is facing three challenges: energy security because one-half of oil is imported by the United States, competitiveness among the global market for nuclear reactors and fuel efficient vehicles, and environmental impact such as greenhouse gas emissions.

To address these challenges, he confirmed that the Obama Administration is planning to reduce oil imports by one-third by 2025, put one million electric vehicles on the road by 2015, help to generate 80 percent of electricity from clean sources, make nonresidential buildings 20 percent more energy efficient by 2020 and cut greenhouse gas emissions 17 percent by 2020 and 83 percent by 2050, from a 2005 baseline.

"If we are going to hit these goals then we need to understand the energy system," Koonin said. "As a whole, energy is a big and expensive system, in private hands, governed by economics and modulated by government policies." With 250 million vehicles on American roads and 130 million households, Koonin said the energy system is not going to change unless the private sector can make money.

He outlined six strategies for attendees that the United States needs to pursue to help solve these challenges and obtain America's energy goals:

- increase vehicle efficiency
- electrify the vehicle fleet
- deploy alternative hydrocarbon fuels
- increase building and industrial efficiency
- modernize the electrical grid
- deploy clean-electricity generation

Koonin encouraged the attendees to continue to support science and research. "Help advocate for basic research," he said. "Remind the political system that basic research is important for all fields if we are going to deal with these problems competitively."

"We need to understand the bigger problems," he continued. "They will affect you as a citizen and a scientist. Advocate for sensible policies and become involved technically. As citizens, we need people who are cross trained in education and the private sector if we are going to change the energy sector."

The conference also focused on biomass energy development in the United States and Europe, and included a look at growing switchgrass in Tennessee as an energy crop as well as Miscanthus x giganteus and willow in the United States and Europe. The second and third days of the conference featured presentations on how to sustainably grow these crops on a global scale, their productivity and land use as well as how to optimize agronomy and harvesting of energy crops, and improve the establishment of Miscanthus x giganteus. Attendees also toured Illinois' Energy Farm, which is located south of the campus. This 320-acre outdoor laboratory is used to study the agricultural issues surrounding biofuel production. ■

"We need to understand the bigger problems. They will affect you as a citizen and a scientist. Advocate for sensible policies and become involved technically. As citizens, we need people who are cross trained in education and the private sector if we are going to change the energy sector."

{Research}

Gene Regulatory Networks in Bee Brain Linked to Behavior

Distinct networks of genes in the honey bee brain contribute to specific behaviors, such as foraging or aggression, according to a study by researchers at the University of Illinois.

The study shows that common, naturally occurring behaviors are under the influence of discrete regulatory networks in the brain. It confirms what years of research into the brain and behavior seemed to indicate: There is a close relationship between changes in gene expression—which genes are actively transcribed into other molecules to perform specific tasks in the cell—and behavior.

"We found that there is a high degree of modularity in the regulation of genes and behavior, with distinct behavioral states represented by distinct gene network configurations," says Gene Robinson, entomology and neuroscience professor and interim director of the IGB, who led the study.

The study made use of the BeeSpace Project, which includes an extensive digitized record of gene expression data from bee brains collected under various conditions. Curated by Illinois medical information science professor and IGB faculty member Bruce Schatz, BeeSpace is a catalog of genes that turn on or off in the bee brain in response to social cues, environmental changes or as a result of hereditary factors. By analyzing gene expression and behavioral data from dozens of studies (which were performed under the auspices of the BeeSpace Project), the researchers were able to get a broad view of the molecular changes in the bee brain that contribute to behavior.

They found a "mosaic" pattern of behavior-related gene expression in the brain. This also predicted that a few transcription factors—genes that regulate other genes—regulate gene expression in all three behavioral categories. The researchers call these "global regulators." Other transcription factors appeared to regulate expression in only one category, such as foraging, but not aggression or maturity. Only four transcription factors were predicted to act like global regulators, while sets of about 15 to 25 transcription factors were behavior-specific. ■

Last Universal Common Ancestor had a complex cellular structure

Scientists call it LUCA, the Last Universal Common Ancestor, but they don't know much about this great-grandparent of all living things.

New evidence suggests that LUCA was a sophisticated organism, with a complex structure recognizable as a cell, researchers report.

The study builds on several years of research into a once-overlooked feature of microbial cells, a region with a high concentration of polyphosphate, a type of energy currency in cells. Researchers report that this polyphosphate storage site actually represents the first known universal organelle, a structure once thought to be absent from bacteria and their distantly related microbial cousins, the archaea. This organelle, the evidence indicates, is present in the three domains of life: bacteria, archaea and eukaryotes (plants, animals, fungi, algae and everything else).

The existence of an organelle in bacteria goes against the traditional definition of these organisms.

The study tracks the evolutionary history of a protein enzyme (called a vacuolar proton pyrophosphatase, or V-H+PPase) that is common in the acidocalcisomes of eukaryotic and bacterial cells.

By comparing the sequences of the V-H+PPase genes from hundreds of organisms representing the three domains of life, the team constructed a "family tree" that showed how different versions of the enzyme in different organisms were related. That tree was similar in broad detail to the universal tree of life created from an analysis of hundreds of genes. This indicates, the researchers said, that the V-H+PPase enzyme and the acidocalcisome it serves are very ancient, dating back to the LUCA, before the three main branches of the tree of life appeared.

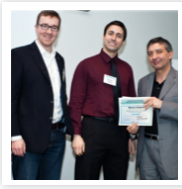
"There are many possible scenarios that could explain this, but the best, the most parsimonious, the most likely would be that you had already the enzyme even before diversification started on Earth," said study co-author Gustavo Caetano-Anollés, a professor of crop sciences and an affiliate of the IGB. "The protein was there to begin with and was then inherited into all emerging lineages."

The study lends support to a hypothesis that LUCA may have been more complex even than the simplest organisms alive today, said James Whitfield, a professor of entomology at Illinois and a co-author on the study. ■

{Around the IGB}

Joint Workshop

University of Illinois at Chicago and Urbana-Champaign Regenerative Biology Workshop



Twice yearly—in the spring at the University of Illinois at Chicago (UIC), in the fall at the University of Illinois at Urbana-Champaign (UIUC)—a workshop on regenerative biology is held to foster interaction between the two campuses research efforts in the area of tissue engineering and regenerative medicine. The current shared focus is on developing tools and products with the potential for near-term clinical translation, which plays to the IGB's strengths in fundamental regenerative biology and engineered scaffolds/biomaterials.

Chaired by Amelia Bartholomew, MD, MPH, FACS, UIC Department of Surgery and Co-Chair Paul Kenis, PhD from the Regenerative Biology and Tissue Engineering research theme, the spring Chicago campus symposium was funded by the Office of the Vice Chancellor for Research, Integra Life Sciences, and the UIC Department of Surgery to facilitate interactive presentations in regenerative medicine by UIC and UIUC campus faculty, internationally acclaimed keynote speakers, and a poster session to highlight and award the work of the top graduate and post-graduate student researchers.

At the invitation of Vice President for Research Larry Schook, Kenis and Bartholomew presented the joint campus collaborative on Stem Cell and Regenerative Medicine to the Board of Trustees and President Michael Hogan. The presentation outlined the goals of the program which included ongoing cross-campus UIC/UIUC interactions, continued interactive joint symposia, development of extended stay capabilities between the campuses to allow students and faculty to spend days or weeks working in collaboration, and facilitation of the national prominence of regenerative medicine research at the University of Illinois. ■

{Around the IGB}

Awards

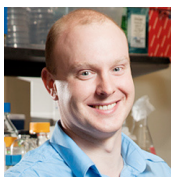
Two IGB Faculty Members named University Scholars

James Slauch and Paul Kenis have been named as University Scholars, a program created to recognize the university's most talented teachers, scholars and researchers.

Kenis, a professor of chemical and biomolecular engineering, performs research in the field of micro fluidics and the development of novel microfluidic tools for applications in energy and health.

Slauch, a professor of microbiology and of medicine, studies Salmonella bacteria, particularly the molecular mechanisms that cause Salmonella infections and allow the bacteria to elude the immune system. ■

NIH Director's New Innovator Award



Douglas A. Mitchell, IGB faculty member in the Mining Microbial Genomes research theme and assistant professor in the Department of Chemistry, was a 2011 award recipient of the National Institutes of Health Director's New Innovator Award.

Mitchell uses chemical methods to study the mechanisms that contribute to bacterial virulence and antibiotic resistance. His current studies focus on the thiazole/oxazole-modified microcins, a class of microbial compounds with profound structural and functional diversity. ■

Entrepreneurship

CEM Program

The Certificate in Entrepreneurship and Management (CEM) for Life Scientists is a program for entrepreneurially minded MD, DVM, PhD students, and Post-Doctoral Associates in the life sciences who are interested in understanding the business, economic, and legal issues in life science start-up ventures. Participants who have the science skills to do groundbreaking research will learn about the business savvy needed to bring discoveries to market.

CEM students will learn the traditional ins and outs of entrepreneurship, such as creating a business plan, managing intellectual property, financial management, and marketing your business and other skills related to entrepreneurial ventures.

The CEM program comprises both classroom lectures on business fundamentals and experiential learning (modeled on the Kauffman FastTrac TechVenture Program) by working in groups on specific innovations.

Scholarships and internships are available upon request. If this program is for you, please consider registering soon, space is limited. Registration deadline is January 15, 2012. Further details about the program, syllabus, application forms and payment options will be available later this month at **www.igb.illinois.edu/cem** ■

Tour

Tour Campus Clocks

Did you know the campus has Gregor Mendel's clock from the 1850's in the Main Library? Or that the Engineering Dean's clock controlled all the bells and clocks on campus from 1898 until the 1960s? On Friday, Nov. 4, please join Bruce Hannon, Prof. Emeritus of Geography and Illinois alum Ph.D. in Engineering Mechanics, for a 10:00am or 1:00pm walking tour of campus clocks. The tour covers the history of mechanical time keeping, the history of eight clocks on campus, and bits of history about the buildings that now house them. Space is limited because some of the clocks are in private offices or small spaces.

For details and to register, go to: **http://go.illinois.edu/IGBclocktour** ■

Fund Drive

Campus Charitable Fund Drive

The 2011 Campus Charitable Fund drive is underway. Please consider contributing! Take a moment to read the brochure by visiting the website at **www.ccfd.illinois.edu**.

A few things you might want to remember:

- We encourage everyone to give by online payroll deduction.
- If you are giving by payroll deduction, please remember to type in the annual amount you wish to donate. There is no limit to the number of agencies that you may select, but the minimum ANNUAL donation is $24.00 ($2 per month).
- When making a one-time donation, make your check(s) payable to the umbrella organization(s) listed on the Pledge Form, not to designations within the umbrella.

If you have any questions throughout the campaign, please contact either Jacinda King at 244-2276 / **jkking@illinois.edu** or Dale Johnston at 244-5595 / **dkjohnst@illinois.edu**. The deadline is November 11, 2011. ■

ADMINISTRATIVE NEWS

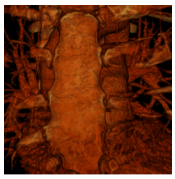
{Operations and Facilities}

I-Card

Check your i-card expiration date!

Contact i-card at 244-0135 or visit **http://www.icard.uillinois.edu/** for information on how to renew your card. ■

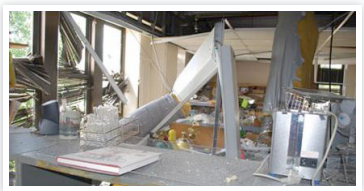
Analyze



Analyze, a 3D image analysis program, was purchased in May by the core facilities. Analyze has many of the ITK image filtering algorithms, such as median and rank smoothing, gradient calculation and convolution. 3D data sets can be segmented manually or automatically using watershed or region growing algorithms. Modules for 3D cell counting, tree analysis and virtual endoscopy are also available. ■

{Safety}

DRS issues New guidelines for the use of hydrogen gas for anaerobic chambers



Understanding the safe use of hydrogen gas and safe operating procedures for anaerobic chambers is necessary to prevent serious incidents. A 2010 incident involving an anaerobic growth chamber at a major University caused ~$750,000 damage and sent several researchers to the hospital for medical evaluation.

Anaerobic Chamber Operation
Anaerobic chambers often use a catalyst and small amounts of hydrogen to remove trace oxygen from the atmosphere by formation of water. The chambers are designed to safely use hydrogen at concentrations below 4%. The concentration of hydrogen inside the chamber must be maintained below 4% as sources of ignition such as incubators, fans, and stirrers are commonly used inside anaerobic chambers. Oxygen catalysts can also ignite explosive gas mixtures without heat, spark or flame.

Hazards of Hydrogen Gas
The explosive range of hydrogen gas is 4%-74%, thus any concentration of hydrogen greater than 4% will form an explosive atmosphere which can be readily ignited by a spark, heat from lab equipment or static electricity.

Safe Use of Hydrogen Gas in Anaerobic Chambers
Explosive atmospheres should be expected when using gas mixtures containing more than 4% hydrogen. In the past, labs often mixed 100% hydrogen with nitrogen to create an approximately 4%/96% mix. Mixing of 100% hydrogen is no longer necessary as the cost of ultrahigh purity pre-mixed hydrogen/inert gas is now comparable to the cost of pure gases. Premixed hydrogen is stocked by the local gas vendor.

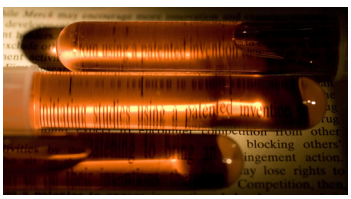
Safety Checklist for Anaerobic Chamber Operations Using Hydrogen Gas

- Use 4% or less H2 / 96% inert pre-mixed gas to eliminate mixing of flammable and explosive hydrogen gas in the laboratory. *The local gas vendor stocks ultra high purity 4%hydrogen/96%inert gas, and will remove partial tanks of 100% hydrogen at no cost to the lab.*
- Use 100% nitrogen (or other inert gas) to flush/purge chambers, airlocks, and antechambers
- Use a monitor with alarm in the anaerobic chamber to continuously monitor oxygen and hydrogen concentrations
- Train all users of anaerobic chambers on standard operating procedures, specific airlock procedures, and emergency procedures
- Document your training and keep it with your Laboratory Safety Manual

If >5 % hydrogen must be used for anaerobic chamber operations, a safety review is required prior to startup of the operation.

For more information on Hydrogen gas safety or other chemical safety related issues contact Bob Mann, IGB Safety Coordinator, or visit the DRS chemical safety website at **http://www.drs.illinois.edu/css/index.aspx** ■

{Biotechnology Information Center }



The following are some additional library-sponsored resources available on the Biotechnology Information Center website at **http://www.library.illinois.edu/biotech/**

PubGet
http://www.library.illinois.edu/orr/get.php?instid=983930
Essentially another way to access PubMed. Allows for quick and easy viewing of the full text of articles

Faculty of 1000
http://www.library.uiuc.edu/orr/get.php?instid=226365
A recommender service. Read what experts in your field have to say about recent articles. Set up alerts in your research area to receive weekly notifications.

Biology Easy Search
http://www.library.illinois.edu/biotech/
Use this to run a keyword, title, or author search against multiple databases at once. Finds articles, books, and e-books.

Online Protocols
http://www.library.illinois.edu/biotech/researchtools/index.html
Find lab methods in one of our many resources for protocols: Current Protocols in series from Wiley, Springer Protocols, Nature Protocols, Cold Spring Harbor Protocols, Methods in Enzymology, and more.

For questions or training in these resources, contact **Katie Newman**, Biotechnology Librarian, Room 2130 IGB, **florador@illinois.edu** ■

{Communications}

Publications

Have you recently published and would like to list the info on the IGB website? Each research theme has an area for publications—to submit content to be included, please send the relevant information to **nvasi@igb.illinois.edu**.

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