IGB NEWS

Volume 8, Number 2

UPCOMING EVENTS

Genomics and Society Lecture Series

Your Inner Fish

April 14, 2015, 4:00 p.m.

National Center for Supercomputing Applications Auditorium
1205 W. Clark Street, Urbana

Neil H. Shubin
Robert R. Bensley Distinguished Service Professor of Organismal Biology and Anatomy
The University of Chicago
Host, PBS, Your Inner Fish

Pioneers Seminar (GEGC)

A New Angle on the Maize Leaf

April 14, 2015, 12:00 p.m.

612 Carl R. Woese Institute for Genomic Biology

Sarah C. Hake, PhD
University of California, Berkeley
Department of Plant Development and Plant Architecture

Art of Science 5.0

Images from the Carl R. Woese Institute for Genomic Biology

April 23, 2015, 6:00 p.m. reception
Exhibit on display through April 27
indi go Artist Co-Op
9 E University Ave, Champaign, Illinois 61820

2015 IGB Fellows Symposium

Bacterial Quorum Sensing and Its Control

May 7, 2015, 8:30 a.m. - 3:00 p.m.

612 Carl R. Woese Institute for Genomic Biology

Bonnie L. Bassler, PhD
Princeton University
Department of Molecular Biology

Register for free at:
http://conferences.igb.illinois.edu/fellows/

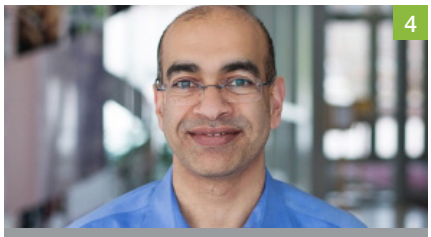
FEATURED NEWS

2

Institute for Genomic Biology Renamed

3

Biomedical Engineering Research Opportunities, Funding Challenges



4

Profile: Vijay Singh

5

On the Grid: Happenings at IGB

IMAGE OF THE MONTH

This month's image is of a mouse heart, cleared and imaged using the LSM 710 Two-photon microscope.

This image is provided courtesy of Mayandi Sivaguru and Glenn Fried of IGB Core Facilities, and Sakthivel Sadayappan of the Sadayappan Lab, Department of Cell and Molecular Physiology, Loyola University Chicago.

IGB News

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

Institute for Genomic Biology Renamed
for Professor Carl R. Woese

The University of Illinois' Institute for Genomic Biology has been renamed in honor of a microbiology professor who changed the course of science with his discovery of a third major branch of the tree of life. That professor, Carl R. Woese, died in late 2012.

"We are now the Carl R. Woese Institute for Genomic Biology," said Swanlund Chair of Entomology and Institute director Gene Robinson. "By changing our name, we honor an individual who has made legendary contributions to science, who served as an Illinois microbiology faculty member for nearly 50 years and who, as a founding member of the IGB, paved the way for us to emerge as a leader in advancing life sciences."

In 1977, Woese and his colleagues overturned a universally held assumption about the basic structure of the tree of life. They discovered that there were three distinct branches, or "domains," of life – not two, as had been previously thought. The new class of organisms they discovered looked superficially like bacteria, but their evolutionary history was completely different. These microbes are now known as archaea (are-KEY-uh), and are genetically and evolutionarily as distinct from bacteria as plants and animals are.

Woese made his discovery by comparing the molecular sequences associated with the cellular machinery that translates the genes of individual organisms into proteins. In doing so, he pioneered the practice of using molecular sequences to gain insights into biology, an approach that has now become standard in biology and is the precursor of today's genomics.

"Carl Woese's discoveries in evolutionary biology have had revolutionary implications for all branches of biology, and no more so than in the emerging science of genomics, which owes its foundation to Carl's work. It is very fitting indeed that the IGB will forever be associated with his name, and it will be an inspiration to all who work here," said Illinois Swanlund Chair of Physics and IGB Biocomplexity theme leader Nigel Goldenfeld, a longtime colleague, collaborator and friend of Woese.

"Since our dedication in 2007, this Institute has carried on the spirit of discovery, dedication and determination so well-embodied by Carl," Robinson said. "His legacy is now an indivisible part of our history." ■

Written by Diana Yates. Photos by Jason Lindsay and Kathyrn Coulter.

From left: IGB Director Gene Robinson, Swanlund Professor of Materials Science and Engineering John Rogers, Associate Professor of Bioengineering (UCSD) Todd Coleman, and Head of Bioengineering Rashid Bashir.

Watch video of the full webcast ***here****.*

In Biomedical Engineering, Experts See Big Research Opportunities and Some Funding Challenges

Bioengineering is already leading to the development of integrated devices for diagnosing and treating diseases or improving health. Researchers are testing implantable, flexible electrodes that can monitor biological function or stimulate cell growth; "lab-on-a-chip" devices that can cheaply diagnose diseases; and better brain-computer interfaces that allow people to control prosthetics or even unmanned aircraft using only brain impulses.

However, the interdisciplinary nature of the field, which relies on experts in engineering, biology, medicine, and physical and materials science, can create challenges for those trying to apply that research and technology. In many cases, they must navigate funding and regulatory agencies accustomed to staying within the bounds of their specialties.

As a result, companies may have to rely on venture capital or crowd-funding instead of government research grants, and to develop technologies for commercial use first, before the military or government agencies adapt them for their own uses, said Amy Kruse, vice president of innovation at Intific, a company that incorporates neuroscience with training and educational software.

"Part of the impact of neurotechnology is that it's leading to the creation of a new industry of applied neuroscience, which takes the amazing research out of the lab and into the home, office, or field," Kruse said. There is a big gap between the "as-seen-on-TV" devices, such as simple brainwave monitors to help people meditate or relax, which are available now, and neurotechnology enhancement devices that could be sold by a pharmacist. Those could build upon technology that is currently only used in laboratories to measure more complex brain states (attention, cognitive workload, distraction, drowsiness, etc.). To get there, the industry needs more trusted companies capable of developing more intricate, vetted applications that draw upon the boom in research advances, she said.

Some government agencies are trying to facilitate approval of new biotechnology devices, said Gregory Farber, director of the Office of Technology Development and Coordination at the National Institute of Mental Health. For example, the National Institutes of Health (NIH) is implementing an infusion of research funding provided by President Obama's BRAIN Initiative. As it awards funding, Farber said, it has been immediately referring researchers to the Food and Drug Administration, which is responsible for approving medical devices. That way, the FDA can work the researchers to ensure they are collecting the data and asking the questions the agency will need to decide if neurotechnology devices are safe, he said.

The Defense Advanced Research Projects Agency (DARPA), a research-funding agency that develops technologies for military uses and to protect national security, is another funder trying to facilitate bioengineering projects. It created a new biological technologies office last April, said Doug Weber, a DARPA neurotechnology program manager.

DARPA's projects currently include research in basic and synthetic biology, understanding the complexity of biological systems, neurological signaling, and human-machine interfaces, which can lead to devices to assist military personnel with brain injuries. He says the key to getting technologies approved for mainstream use is to engage all stakeholders early on so that by the time a device is ready for a clinical trial, researchers have asked the right questions.

Asked how to make interdisciplinary teams work, Rashid Bashir, head of the department of bioengineering at the University of Illinois, said a person has to learn enough about the other fields to have a conversation. He also recommended making the responsibilities for each expert clear, and keeping the relationship a true collaboration on a problem, not just instruction about one step.

Todd Coleman, director of the Neural Interaction Laboratory at the University of California, San Diego, said he has learned first-hand that working in different fields can spur the development of new techniques in one's core discipline, a fact that he uses to attract more people to interdisciplinary fields. Coleman earned a Ph.D. in electrical engineering, but after a postdoctoral appointment in computational neuroscience, he has continued to work on interdisciplinary teams on neurobiological challenges. One of his recent projects, which uses biofeedback from a person's brain to fly an unmanned aerial vehicle along a designated route, required developing a new type of applied mathematics, he said.

John Rogers, director of the F. Seitz Materials Research Laboratory at the University of Illinois, faced a similar challenge. Silicon electronics are usually hard and flat, but biological structures are curved, irregular, and three-dimensional. To better integrate circuits within living bodies, he developed flexible electronics that can be turned into a biological-like membranes or three-dimensional structures with a variety of shapes.

The time-honored way to become involved in interdisciplinary research, said Gene Robinson, director of the Carl R. Woese Institute for Genomic Biology at the University of Illinois, is to focus on one specialty first and then branch out later. But Robinson also pointed out there is great interest in experimenting with hybrid training programs to better prepare future scientists and engineers to work at the boundaries of the disciplines.

Weber also recommended finding mentors who can provide guidance, from both inside universities and outside them, and collaborate with established experts in complementary fields. Finally, think beyond the NIH and the National Science Foundation for biomedical engineering research funding — look at DARPA, military branches and other government agencies, said Kruse.

"Our work is to live at the intersection of biology, engineering, and the physical sciences," said Weber of DARPA. "I really do believe that there are tremendous opportunities at that intersection, and we're working hard to find and exploit those opportunities." ■

From 2 February 2015 www.aaas.org, written by Kathleen O'Neil. Reprinted with permission from AAAS.

PROFILE

Vijay Singh is a Professor of Food and Bioprocess Engineering and the Associate Director of Engineering at the Integrated Bioprocessing Research Laboratory. His research focuses on the development of bioprocessing technologies for corn biomass to ethanol, advanced biofuels, food and industrial products.

Vijay Singh:
Fueling the Future

Singh has been working with biofuels from the start, long before many others flocked to the technology that could deliver a clean-burning, homegrown alternative to fossil fuels. And while some may argue that the heyday for biofuels has passed, Singh asserts the future remains bright.

"I know there is a lot of oil that is being discovered in the U.S. and other places, but it is a short term solution," Singh said. "We cannot rely on oil forever. What happens 500 years from now? We will have to begin to rely on something renewable, because eventually we are going to run out of fossil fuels."

Singh has devoted his career to establishing a renewable source of fuel. After earning his M.S. and Ph.D. in agricultural and biological engineering at the University of Illinois, he went on to work as a visiting scientist at the United States Department of Agriculture, where he worked on recovering additional coproducts in ethanol production processes.

One of his goals was to recover corn fiber that contains phytosterols, value-added nutraceuticals which have been shown to reduce cholesterol. Today these natural cholesterol-reducing products are added to margarines, salad dressings, orange juice, and more.

"At that time, we worked on improving corn processing for ethanol production," Singh said. "As we started to develop new processing techniques, I became more and more interested in bioenergy. Then suddenly the industry took off, and everybody got into ethanol production."

In 2002, he returned to Illinois to start a research program on corn ethanol production. Today Singh and his lab are developing novel bioprocessing technologies that maximize the recovery of different constituents from biomass and their conversion into higher value products.

Singh is a member of the PETROSS (Plants Engineered to Replace Oil in Sugarcane and Sweet Sorghum) project, funded by ARPA-E (Advanced Research Projects Agency—Energy) within the U.S. Department of Energy. PETROSS engineers two of the world's most productive crops—sugarcane and sweet sorghum—into ultra-productive biofuel crops, with significantly higher yields and profit margins than any existing biofuel crop.

The U.S. currently imports $1 billion of crude oil, using 180 billion gallons of fossil fuel for transportation alone. Whether foreign or domestic, this fuel is a finite resource that is environmentally harmful to obtain and use. PETROSS crops are a renewable, sustainable alternative to fossil fuels. Using underutilized land alone, these crops could produce more than 25% of the oil currently imported. PETROSS could contribute 70% of the clean-burning biofuel needed to achieve the Renewable Fuel Standard mandate and Greenhouse Gas reduction requirements.

"As we started to develop new processing techniques, I became more and more interested in bioenergy. Then suddenly the industry took off, and everybody got into ethanol production."

With that in mind, Singh is in charge of figuring how to extract oil for biodiesel production and evaluating its worth. PETROSS plants are engineered to produce 200 times more oil than normal sugarcane and sorghum plants. These plants, with just 2% oil, produce one and a half times more per acre of soybean, and two times more ethanol per acre of corn.

"PETROSS Director Steve Long and his team are putting the genes in the plant to produce the oil, but we are taking that actual final product and pulling the oil out and converting that into biodiesel," Singh said. "Using all the work we have done on processing, we are further improving our model to predict what would be the cost to produce a gallon of biofuel from PETROSS crops."

So far, his results show promise that PETROSS is a viable commodity—a key component to meet growing energy demands.

"We will need everything," Singh said. "I don't think we will be able to get to the same scale with biofuels that we are at right now with fossil fuels. We will need solar power. We will need wind energy. And we will need biofuels in addition to other renewable sources of power."

Written by Claire Sturgeon. Photo by Haley Ahlers.

PETROSS

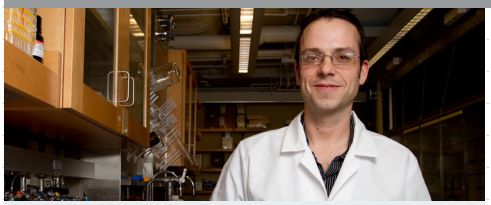
The PETROSS project is working on five components to develop sugarcane and sweet sorghum into ultra-productive biofuel crops:

- *Produce Oil in Place of Sugar*
- *Increase Photosynthesis*
- *Boost Cold Tolerance*
- *DNA Assembly*
- *Techno-Economic Analysis*

Visit the newly redesigned PETROSS site for more information: petross.igb.illinois.

ON THE GRID
HAPPENINGS AT THE IGB

AWARDS



KRISTOPHER KILIAN

Kristopher Kilian, Assistant Professor of Materials Science and Engineering (Regenerative Biology & Tissue Engineering) received a National Science Foundation CAREER Award for his work in regenerative medicine and his initiative in educating students about stem cell engineering.

CHARLES SCHROEDER

Charles Schroeder, Associate Professor of Chemical & Biomolecular Engineering (Biosystems Design) has been named a Dr. Ray and Beverly Mentzer Faculty Scholar, a position established through a gift from an alumnus of Chemical Engineering, Dr. Ray Mentzer and his wife Beverly Mentzer.

BRYAN WHITE

Bryan White, Professor of Animal Sciences and Director, the Mayo Clinic/University of Illinois Strategic Alliance for Technology-Based Healthcare (Biocomplexity), has been elected to Fellowship in the American Academy of Microbiology, recognizing excellence, originality, and leadership in the microbiological sciences.

FEATURED SPEAKER

NEIL SHUBIN, "YOUR INNER FISH"

Have you ever wondered why the human body looks the way it does? Why our hands have five fingers instead of six? Why we walk on two legs instead of four? It took more than 350 million years for the human body to take shape. How did it become the complicated, quirky, amazing machine it is today? The truth is, hidden within is a story of life on Earth.

Join Neil Shubin, the Robert R. Bensley Distinguished Service Professor of Organismal Biology and Anatomy at University of Chicago and host of the PBS show "Your Inner Fish" as he speaks as part of IGB's Genomics and Society lecture series.

Tuesday, April 14, 4:00pm
National Center for Supercomputing Applications Auditorium
1205 W. Clark Street, Urbana

GIVING

WALK OF LIFE

The double helix–the classically beautiful twisting ladder that forms the shape of DNA–is beautifully depicted within the landscape of the IGB.

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.

Walk of Life pavers are also the perfect way to commemorate anniversaries or special events. Deadline for spring commencement is March 30.

Contact Melissa McKillip at *mmckilli@illinois.edu* or find more information at **www.igb.illinois.edu/about/giving**.

ART EXHIBIT

ART OF SCIENCE 5.0

Save the date for the next show of the IGB's Art of Science exhibit, celebrating five years of common ground between science and art. Showcasing imagery from the Core Facilities at the IGB, the Art of Science highlights cutting-edge research that is addressing significant problems in the environment, medicine, energy use and production, and fundamental research.

Opening Reception
Thursday, April 23, 6:00 - 8:00 p.m.

Exhibition Hours
Friday, April 24, 6:00 - 8:00 p.m.
Saturday, April 25, 12:00 - 4:00 p.m.
Sunday, April 26, 12:00 - 4:00 p.m.
Monday, April 27, 6:00 - 8:00 p.m.

Indi Go Artist Co-op
9 E. University Ave., Champaign

ON THE GRID
HAPPENINGS AT THE IGB

JOURNALS

JOURNAL COVERS

Jonathan Tietz of the Doug Mitchell Lab was first author of the cover feature of the February 19, 2015 issue of Chemistry & Biology (above left), a journal published by Cell Press. The cover image reflects the paper content on how underexplored bacteria represent fruitful reservoirs of abundant, bioactive natural products.

Sara Pedron Haba of the Brendan Harley lab was first author of the inside back cover of the March 4, 2015 issue of Advanced Materials (above right). The image depicts the use of microfluidic forming tools to generate optically translucent hydrogels, to monitor one of the most common, aggressive, and deadly forms of brain cancer.

BLOOD DRIVE

IGB BLOOD DRIVE RETURNS

The next IGB blood drive will take place on May 11, 2015. Please note this is in place of the original April 22, 2015 drive, due to scheduling conflicts.

The blood drive will take place in the lower concourse area of IGB, near Array Cafe.

SUMMIT

ARPA-E SUMMIT IN D.C.

Stephen Long, Professor of Plant Biology and Crop Sciences, recently presented at the ARPA-E summit in Washington, D.C. on the PETROSS project (Plants Engineered to Replace Oil in Sugarcane and Sweet Sorghum). Long (right) gave very successful presentations to new ARPA-E Director Dr. Ellen Williams (second from right) and ARPA-E Program Director Dr. Jonathan Burbaum (left).

Long also spoke to the University News Bureau about PETROSS, specifically the biodiesel component of their research, in advance of the summit at D.C, as part of their "A Minute With..." series. Read the article **here**.

EMPLOYMENT

COMPUTATIONAL GENOMIC MEDICINE POSITIONS

Opportunities exist for employment at the IGB within the field of computational genomic medicine. A postdoctoral researcher is needed to lead analyzing genomic data from multiple interrelated projects with the potential to yield multiple high-impact papers. Programmers are also sought to design and develop novel software for the analysis of large-scale biological datasets.

For full details, please visit:
www.igb.illinois.edu/about/employment.

FELLOWS

IGB FELLOWS SYMPOSIUM

Registration now open - visit:
http://conferences.igb.illinois.edu/fellows/

Learn about IGB research, hear about current issues in the life sciences, and connect with other students on campus at the annual Fellows Symposium. This full-day event, sponsored by the Carl R. Woese Institute for Genomic Biology, is also your chance to share your research at the popular poster session and reception.

The keynote speaker this year is Bonnie Bassler, Squibb Professor in Molecular Biology and Chair, Department of Molecular Biology at Princeton University. Her talk, "Bacterial Quorum Sensing and Its Control," concerns bacteria and how they communicate with one another via the production and detection of secreted signal molecules called autoinducers. This cell-to-cell communication process, called "Quorum Sensing," allows bacteria to synchronize behavior on a population-wide scale. Behaviors controlled by quorum sensing are usually ones that are unproductive when undertaken by an individual bacterium acting alone but become effective when undertaken in unison by the group.

As always, we will hold a poster session for your chance to share your work with your peers in the life sciences. The poster session is a great way to practice your presentation skills, and prizes will be awarded for the top three posters. The poster session is open to everyone, and posters can be submitted during registration.

Lunch will be provided. If you have any questions or problems regarding registration, or if you would like more information, please contact us at *fellows-symposium@igb.illinois.edu*.

ADMINISTRATIVE NEWS

BUSINESS

GRANT PROPOSAL TEAM

The life of a researcher is a hectic one. Writing proposals is just one item on a long list of important tasks requiring your attention. Fortunately, the IGB has the resources to help you submit a successful grant proposal so you can get back to your research.

The business office is available for submission training or to help you navigate forms, prepare subcontract documents, and by liaising between OSPRA and the Sponsor Grants Management Office. The communications and outreach groups can assist you with incorporating outreach activities, editing your proposal, or creating a website when required.

The outreach group will provide support for outreach activities and education programs for a grant. Some successful programs that can be produced include: summer day camps, 1-5 day training workshops, and open houses to educate targeted audiences and the general public about specific research.

For more information please visit
http://www.igb.illinois.edu/content/grant-proposal-team. ■

CNRG

BIOCLUSTER UPGRADE

New upgrades to biocluster will begin over the summer. This will include updating the software that runs the cluster as well as the disk storage system that provides storage to all of the cluster.

The upgrade of the storage system will change how storage is done significantly. We currently use a piece of software from IBM called GPFS to tie together three storage servers with a grand total of 700TB of data spread across them. This upgrade will move us to another technology called Gluster. Gluster is free (unlike GPFS) and will allow us to make many improvements to how data is stored. Currently if any of the three GPFS data servers fail, the storage of biocluster fails because a portion of the data cannot be accessed. Once we move to Gluster, data will be replicated (present on at least two systems). This means if one server fails, the cluster will continue unaffected. Once the system is restored, any changed data is properly replicated back to the node that failed. Additionally, snapshots or "read-only looks" can be taken of the Gluster system. If a file is accidentally deleted, it can likely be restored from a prior snapshot. Because of these snapshots and data replication, the only real purpose for a tape backup system would be to prevent data loss in a catastrophe such as a fire or tornado. Because of this, we plan to switch the backup policy on biocluster from backing up by default to not backing up by default. You will be able to choose what data you want by copying it to a directory called "backup" or requesting to add a directory be added to the backup service.

The end result is a more reliable disk system with more features that will reduce the cost of most storage on biocluster from $15/TB/mo to $10/TB/mo. To have any data on the tape backup service will be an additional $3/mo/TB.

Additionally, we will also be updating the head node of biocluster and adding a login node to biocluster. A login node will separate the cluster management from where users are allowed to submit jobs. This will result in a more stable platform with a lower possiblity of users causing system-wide issues on the cluster. ■

UNIVERSITY LIBRARY

NEW PUBLIC ACCESS PLANS RELEASED BY FUNDERS

In February, three funding agencies - AHRQ, USDA and NASA - released plans for public access to funded research (i.e., publications and data). These plans are in response to the White House's Office of Science and Technology Policy (OSTP) memo "Increasing Access to the Results of Federally Funded Scientific Research." Here are a few highlights from the plans:

Agency for Healthcare Research and Quality (AHRQ)

- The AHRQ Public Access Policy will be in full effect by October 2015.
- Grantees will be required to submit final, peer-reviewed journal manuscripts to PubMed Central.
- Whenever possible, digital data from funded research "should be stored and publicly accessible to search, retrieve, and analyze."

United States Department of Agriculture (USDA)

- The plan outlines how USDA will implement (over the next few years) policies, procedures, infrastructure, and outreach & training to increase public access to USDA-funded publications and data.
- Beginning January 1, 2016, grantees will be required to deposit manuscripts in the USDA public access archive, PubAg.

National Aeronautics and Space Administration (NASA)

- NASA plans to have its policy fully implemented by October 2015.
- Grantees will be required to submit final, peer-reviewed journal manuscripts to PubMed Central, which NASA selected as the best manuscript repository for its needs.
- Grant applications will soon require data management plans, which address whether and how digital data will be preserved and accessible.

If you have questions about or would like guidance on these requirements, please contact Sarah Williams, the Life Sciences Data Services Librarian (*scwillms@illinois.edu*), or the Research Data Service, headquartered in the University Library (**http://researchdataservice.illinois.edu/**). ■

RECENT PUBLICATIONS

Please include your connection to the IGB in your author byline when submitting publications, as it will greatly help track potential newsworthy items and increase the possibility of coverage.

Hong P-, Mao Y, Ortiz-Kofoed S, Shah R, Cann I, Mackie RI. Metagenomic-based study of the phylogenetic and functional gene diversity in galapagos land and marine iguanas. *Microb Ecol*. 2015;69(2):444-456.

Ren X, Bischoff D, Weisgerber DW, et al. Osteogenesis on nanoparticulate mineralized collagen scaffolds via autogenous activation of the canonical BMP receptor signaling pathway. *Biomaterials*. 2015;50:107-114.

Kim SM, Guo J, Kwak S, Jin Y-, Lee DK, Singh V. Effects of genetic variation and growing condition of prairie cordgrass on feedstock composition and ethanol yield. *Bioresour Technol*. 2015;183:70-77.

Weisgerber DW, Caliari SR, Harley BAC. Mineralized collagen scaffolds induce hMSC osteogenesis and matrix remodeling. *Biomater Sci*. 2015;3(3):533-542.

Roca AL, Ishida Y, Brandt AL, Benjamin NR, Zhao K, Georgiadis NJ. Elephant natural history: A genomic perspective. *Annu Rev Anim Biosci*. 2015;3:139-167.

Mallott EK, Malhi RS, Garber PA. Brief communication: High-throughput sequencing of fecal DNA to identify insects consumed by wild weddell's saddleback tamarins (*saguinus weddelli, cebidae, primates*) in bolivia. *Am J Phys Anthropol*. 2015;156(3):474-481.

Kim T, Zheng S, Sun J, et al. Dynamic visualization of alpha-catenin reveals rapid, reversible conformation switching between tension states. *Curr Biol*. 2015;25(2):218-224.

Stein LR, Bell AM. Consistent individual differences in paternal behavior: A field study of three-spined stickleback. *Behav Ecol Sociobiol*. 2015;69(2):227-236.

Wang Y, Zhang ZT, Seo SO, et al. Markerless chromosomal gene deletion in *clostridium beijerinckii* using CRISPR/Cas9 system. *J Biotechnol*. 2015.

Grinberg IR, Yin G, Borovok I, et al. Functional phylotyping approach for assessing intraspecific diversity of *ruminococcus albus* within the rumen microbiome. *FEMS Microbiol Lett*. 2015;362(3):1-10.

Li X, Yu VY, Lin Y, et al. Expanding xylose metabolism in yeast for plant cell wall conversion to biofuels. *eLife*. 2015;2015(4):1-55.

Wertin TM, Reed SC, Belnap J. C3 and C4 plant responses to increased temperatures and altered monsoonal precipitation in a cool desert on the colorado plateau, USA. *Oecologia*. 2015.

Kim T-, Joo C, Seong J, et al. Distinct mechanisms regulating mechanical force-induced Ca2+ signals at the plasma membrane and the ER in human MSCs. *eLife*. 2015;2015(4).

Hollister SJ, Flanagan CL, Zopf DA, et al. Design control for clinical translation of 3D printed modular scaffolds. *Ann Biomed Eng*. 2015.

Kim SR, Xu H, Lesmana A, et al. Deletion of PHO13, encoding haloacid dehalogenase type IIA phosphatase, results in upregulation of the pentose phosphate pathway in *saccharomyces cerevisiae*. *Appl Environ Microbiol*. 2015;81(5):1601-1609.

Wang X, Ort DR, Yuan JS. Photosynthetic terpene hydrocarbon production for fuels and chemicals. *Plant Biotechnol J*. 2015;13(2):137-146.

Ponnuraj N, Kolossov V, Parkinson E, Benefiel A, Hergenrother P, Gaskins H. Deoxynyboquinone and its derivatives upregulate glutathione-specific genes in MDA-MB-231 breast cancer cells. *FASEB J*. 2014;28(1).

Chang HX, Yendrek CR, Hartman GL. Secretory plant cell wall degrading enzyme expression analysis and polygalacturonase modeling of fusarium virguliforme. *Phytopathology*. 2014;104(11):24-24.

Gerlt J. Discovery of novel enzyme activities and metabolic pathways. *FASEB J*. 2014;28(1).

Perez IB, Brown PJ. The role of ROS signaling in cross-tolerance: From model to crop. *Front Plant Sci*. 2014;5:754.

Seok S, Fu T, Choi S-, et al. Transcriptional regulation of autophagy by an FXR-CREB axis. *Nature*. 2014;516(729):108-111.

Chao W, Kolski-Andreaco A, Juliano CE, et al. September 2014: This month in JoVE-visualizing coral, injecting hydra, engineering corneal implants, and assessing traumatic brain injury in children. *J Vis Exp*. 2014(91):e5509.

White BA, Lamed R, Bayer EA, Flint HJ. Biomass utilization by gut microbiomes. *Annu Rev Microbiol*. 2014;68:279-296.

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

Zhou X. Whole-genome sequencing of the snub-nosed monkey provides insights into folivory and evolutionary history. *Nat Genet*. 2014;46(12):1303-1310. ■

ILLINOIS

IGB News is published by the IGB Communications Office.
Contact Nicholas Vasi (nvasi@illinois.edu)
www.igb.illinois.edu 15.043