



IGBNEWS

Achievements, awards, and information about the IGB community

Volume 6, Number 3



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Upcoming Events

Art of Science 3.0 Opening Reception

April 18, 2013
6:00 p.m. —8:30 p.m.

Indi Go Gallery
9 E. University Ave.
Champaign, IL 61820

Join us for the third year of the 'Art of Science: Images from the Institute for Genomic Biology' an event that successfully spans two divides; art and science, and town and gown.

Fifth Annual Energy Biosciences Institute Biofuels Law and Regulation Conference

April 19, 2013
8:00 a.m.—5:00 p.m.

I Hotel and Conference Center
1900 S. First St., Champaign
IL 61820

A one-day conference bringing together the field's leading experts to explore the challenges in creating a bioenergy-based future.

"Emerging Issues for Advanced Biofuel Commercialization"

Pioneers in Genomic Biology Lecture Series

April 23, 2013
12:00 p.m.

612 Institute for Genomic Biology
Edison Liu, MD
President and CEO, The Jackson Laboratory

**"Cancer Genomics:
Lessons from the Long Tail"**

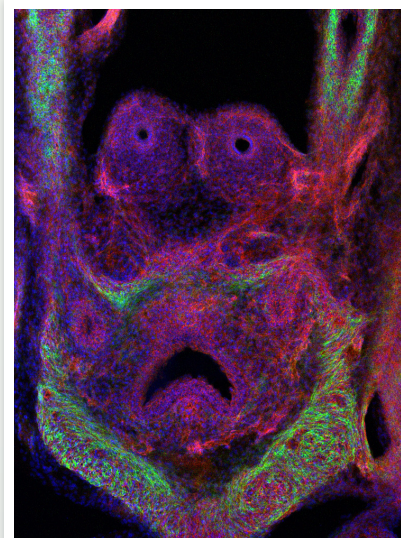
2013 IGB Fellows Symposium

May 2, 2013
8:30 a.m.—4:00 p.m.

612 Institute for Genomic Biology
Learn about IGB research and connect with other students on campus at our full-day event and poster session. Featuring guest lecturer Michael Lynch.

"The Drift-Barrier Hypothesis and the Evolution of Subcellular Features"

Image of the Month



This month's image shows the expression of the enzyme Cre recombinase in the prostate and ureter cells of an animal embryo. It was provided by Chase Bolt and Xiaochen Lu of Lisa Stubbs' group. The image was taken with the Zeiss LSM 710 Confocal Microscope.

IGB News

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

Jay Kesan: At the Intersection of Business, Law and Technology

Jay Kesan, who is best known for his work on the patent system and intellectual property (IP) protection, is happiest working, which is lucky because he has been especially busy this past year.

"I am happy working 24/7," says Kesan with a smile. "Professional happiness is important to me and being fortunate enough to work on things that interest and motivate me make me feel very thankful and lucky."

Kesan's expertise in patent law and IP led to an invitation last October from the U.S. Patent and Trademark Office (USPTO) to become a Thomas Edison Scholar there. This prestigious position requires him to split his time between the University of Illinois (where, in addition to leading the IGB's BioBEL theme, he is Professor and H. Ross & Helen Workman Research Scholar and director of the Program in Intellectual Property & Technology Law) and Washington DC. He has been teaching at the College of Law on Mondays and then dashing to D.C. Tuesdays through Fridays. It is common for government entities like the FCC, the EPA and even the IRS to bring academics in, he says.

"It's a way of bringing expertise and deep knowledge about topics," into their offices, says Kesan (pronounced KAY-son).

During his time as Edison Scholar he has worked with USPTO staff to investigate how a standardized set of metrics associated with patent office quality (including the searching and examination functions) may be developed, and how those metrics might improve the prospects of work-sharing among international offices; and conduct empirical patent research applicable to all patent applications, particularly those on the frontier of patent law changes and innovation policy.

And, although his term is set to expire soon, Kesan has already been asked if he can spare a few days a month to extend his relationship with the USPTO. It means he'll have to continue splitting



» Jay Kesan, BioBEL theme leader at the IGB, holds faculty appointments in the College of Business, the College of Engineering, and the College of Law.

his time between the University and D.C., but he's happy to do it. It's a mutually beneficial arrangement, since in addition to sharing his own expertise, Kesan is able to attend significant hearings and roundtables and has access to data important to his own research interests.

While Kesan focuses on patent law and intellectual property he also makes time for issues more likely to be of interest to the general public. As co-host of "Legal Issues in the News," a weekly WILL radio program, he addresses everything from the Kardashians' copyright woes to whether the government needs a subpoena to read your emails or not.

Kesan, who has been at the University for 15 years, stumbled into the law by way of engineering, but looking back it almost seems foreordained. He earned his PhD, as well as some patents, in electrical and computer engineering at the University of Texas at Austin in 1989. Even as a doctoral student he was a strong writer, receiving a nomination for the "best dissertation award." After earning his PhD he worked as a staff scientist for four years at IBM's T.J. Watson Center. There he was working as an engineer in partnership with some lawyers on a licensing agreement. His lawyer colleagues thought his strong writing skills, combined with his engineering background, meant he should consider law school, which he

did. He never looked back and appears very happy to have landed, as he says, at the intersection of business, law and technology.

With faculty appointments in the IGB, the College of Business, and the College of Engineering, in addition to the College of Law, Kesan's expertise clearly fills a valuable need within all those disciplines. One area in which business, law and technology intersect is in biofuels, a field Kesan works frequently in.

"There is not a lot of research addressing the legal and regulatory issues affecting the successful commercialization of second-generation biofuels," he says.

Luckily, given his particular expertise, he was able to testify before a Congressional subcommittee on energy and the environment in support of the Renewable Fuel Standard. He was able to provide lawmakers information about the impact of the RFS, an essential piece of legislation supporting the development of biofuels, which has been under some attack recently.

Given his engineering background it's no surprise that Kesan is especially interested in how existing laws can address scientific and technological developments. Kesan analyzes existing policies, in biofuels, for example, to see if they are working and how to improve them. Kesan has to keep up, not only with the legal issues at play, but also the latest advances in science and technology. In the case of biofuels, he recently investigated how biobutanol, a new biofuel not currently in the existing regulatory framework, could be made to fit in.

In settings where great technological innovation that has the potential to increase social welfare is taking place, like at the IGB, Kesan argues that regulations should be similarly innovative. His analysis, for example, found that the existing Clean Air Act regulations for new fuels and fuel additives creates an unnecessary burden on the production of biobutanol. He has proposed several actions the EPA could take to remove those burdens within the Clean Air Act with some fairly technical shifts within the "Substantially Similar Rule" of the CAA. In addition, he proposes the EPA can increase the lawful blending limits to the optimal point where their use provides greater potential to reduce GHG emissions and does not produce negative emissions effects.

"It's important to make sure that we can incentivize innovation in all areas," says Kesan. "Protection is a way to spur innovation and to allow someone to take risks."

At the rate innovation is occurring, both on campus and in the wider world, it appears Kesan will be very busy for a long time to come.

Story by Deb Aronson. Photo by Kathryn Coulter. ■

Digging Down Below the Tree of Life

Originally published on www.astrobio.net.

A family tree unites a diverse group of individuals that all carry genetic vestiges from a single common ancestor at the base of the tree. But this organizational structure falls apart if genetic information is a communal resource as opposed to a family possession.

Some evidence suggests that early evolution may have been based on a collective sharing of genes. A group of researchers are now searching for clear genetic vestiges from this communal ancestry.

But it's hard to shake our fascination with family trees.

My father used to travel for work, and when he arrived in a new city, he'd open up the phone book and check for anyone listed with our uncommon last name. Occasionally he'd get a hit and brazenly call them up to ask: "Are we related?"

The answer was always yes, with the common link often being my great grandfather.

Like my father, biologists are curious about family ties, but they go about it in a more systematic way. Rather than phone books, they sift through genetic codes from humans to bacteria and a lot in-between. The main question is: are the commonly-held genes similar enough to point to a common origin?

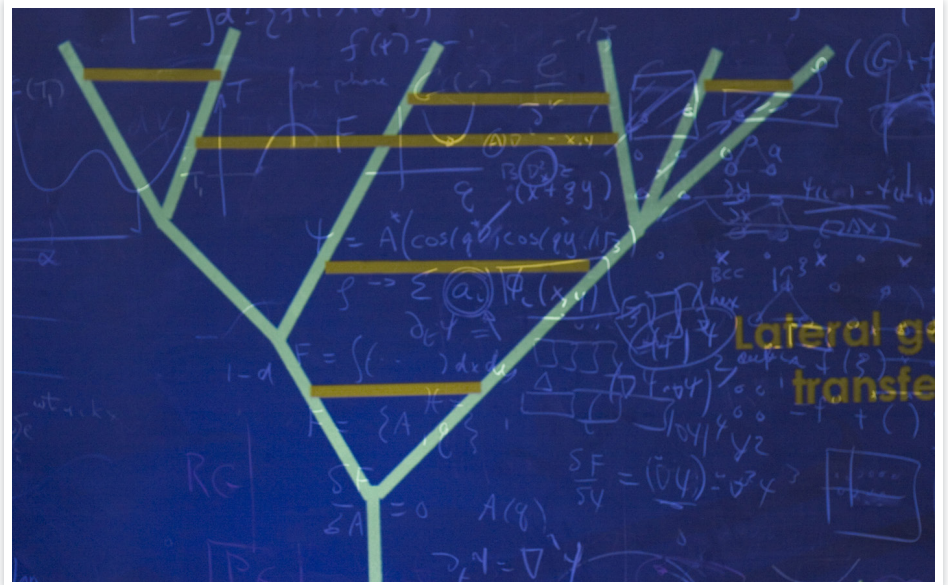
The answer has always been yes. The implication is that we all belong to some universal tree of life. And at the base of this tree – some have imagined – there sits a mild-mannered microbe that lived over 3 billion years ago, unaware that its genes would be the starting point of an entire planet's worth of highly-differentiated life.

However, this organism, the so-called last universal common ancestor (or LUCA), may be just a fantasy.

"Our perspective is that life emerged from a collective state, and so it is not at all obvious that there is one single organism which was ancestral," says Nigel Goldenfeld, Swanlund Professor of Physics and leader of the Biocomplexity research theme at the IGB.

The organisms belonging to this collective state would have shared genetic information from neighbor to neighbor, rather than solely from parent to offspring. Goldenfeld is leading a new NASA Astrobiology Institute (NAI) team that aims to provide a clearer understanding of this early stage of evolution.

"We are hoping to find fossils of the collective state in the genomes of organisms," Goldenfeld says.



» Horizontal (or lateral) gene transfer allows for the sharing of genes between organisms, common among bacteria and archaea.

Goldenfeld's team will be performing genetic studies that will try to tease out signatures of community-based evolution. They will complement this field and laboratory work with theoretical modeling and computer simulations.

"The ultimate goal is to understand how our planet's biochemistry is an instantiation of the universal laws of life, thus addressing the question of whether life is an inevitable and thus widespread outcome of the laws of physics," Goldenfeld says.

A time before Darwinism

It might sound strange that an organism's genetic code could be the result of "crowd sourcing." We are more familiar with traditional reproduction, as practiced by the birds and the bees.

In so-called "vertical gene transfer," an organism inherits its genome from its parents, but it does not receive an exact copy. Small changes enter the code through reproductive mixing and mutations. This "descent with modification," as Darwin put it, eventually allows a population of interbreeding organisms (or species) to evolve.

If every snippet of DNA was solely the product of descent with modification, then every organism could be placed on a tree of life stemming from a single ancestor. But as it turns out, "different genes go back to different ancestors," says Peter Gogarten of the University of Connecticut, who has done extensive work on comparative genetics.

How is that possible? It can happen if organisms share genes. Imagine a gene belonging to

members of a specific family tree. One day this gene becomes isolated and gets picked up by another organism with a different family tree. No reproduction between partners takes place – only an "adoption" of a specific gene.

This so-called "horizontal gene transfer" is quite common among bacteria and archaea, as exemplified by antibiotic resistance. When a specific bacterium develops a defense against some drug, the corresponding gene can pass horizontally to others in the same colony.

A 2008 study in the *Proceedings of the National Academy of Sciences* (PNAS) found that 80 percent of the genes in bacteria were horizontally transferred at some point in the past.

Complex organisms also exhibit evidence of horizontal (or lateral) gene transfer, albeit to a lesser extent. Researchers have shown that ancient ancestors of plants and animals "swallowed up" other bacteria to form symbiotic relationships, which eventually resulted in specialized cellular components, such as mitochondria and chloroplasts.

In his work, Gogarten has shown that horizontal gene transfer turns the tree of life into a thick bush of branches that interweave with each other. Many of these branches terminated long ago due to extinction, but some of their genes live on in us, thanks to horizontal gene transfer.

Several studies suggest that horizontal gene transfer was more prevalent in the past when nothing but single-celled organisms inhabited the Earth.

Monthly Feature

"I like to think of early life as being more like an undifferentiated slime mold," Goldenfeld says. "Such a communal form of life would have no meaningful family tree, because it is the community that varies in descent, not individual organismal lineages."

Evolving evolution

The late Carl Woese, a colleague of Goldenfeld, was one of the first scientists to propose that early life leaned heavily on horizontal gene transfer. Woese passed away in December of last year. He is perhaps best-remembered for classifying life into the now-well-accepted domains of bacteria, eukaryotes (plants, animals, fungi and protists) and archaea.

In 1987, Woese wrote about the consequences of rampant horizontal gene transfer. In such a scenario, "a bacterium would not actually have a history in its own right: it would be an evolutionary chimera."

A "chimera" is the name of a creature from Greek mythology that mixed together features of a lion, a goat and a snake. This hybridization presumably gave the chimera an advantage over its "competitors."

In a 2006 *PNAS* paper, Kalin Vetsigian, Woese and Goldenfeld showed that microbial chimeras may also have an advantage over their biological counterparts. The researchers used computer models to demonstrate that the genetic code could evolve more efficiently if organisms shared their genes collectively. Horizontal gene transfer turned out to be a better "innovation-sharing protocol" than vertical (Darwinian) transfer.

Now, with his NAI team, Goldenfeld wants to confirm these simulations with genetic studies. Specifically, they will target archaea, whose genes have yet to be scrutinized as closely as those from

the other domains, Goldenfeld says.

The group is particularly interested in the question of how the ability to evolve originally developed. The "evolution of evolution" sounds

“I like to think of early life as being more like an undifferentiated slime mold,” Goldenfeld says. “Such a communal form of life would have no meaningful family tree, because it is the community that varies in descent, not individual organismal lineages.”

like a chicken-and-egg problem – especially if you think, as Goldenfeld does, that life is by definition something capable of evolving.

However, evolution can utilize different mechanisms to achieve the same goal. Goldenfeld's team will try to recover some of life's former evolutionary phases by stressing cells and then seeing how their genomes rearrange in response.

Universal Biology

However, DNA evidence is just one aspect of this 5-year research project.

"We want to understand how evolution works before there were species or maybe even genes," Goldenfeld says. "So this is going beyond 'origin of species' approaches to evolution, such as population genetics."

How does one study evolution without genetics? One considers the "rules of the game" that the genetic code is just one manifestation of.

Goldenfeld calls this "Universal Biology." It is an attempt to distill from our specific biochemistry the general physical laws that animate matter.

Being a physicist, Goldenfeld gives the example of thermodynamics. Life must obey conservation of energy and the law of increasing entropy, which will certainly influence how organisms optimize their use of resources.

Other rules involve how to control the amount of variation in the genome from one generation to the next. Too little variation, and organisms can't adapt to changes in the environment. Too much variation, and organisms can't retain useful traits.

The team can place different sets of rules into a computer simulation and see what sort of artificial life appears. Goldenfeld believes that formulating the principles of Universal Biology may help answer one of the biggest questions of all.

"We would like to have a better understanding of why life exists at all," Goldenfeld says. "Is it a phenomenon that should be generic, like the formation of a crystalline solid, or is it something rare and bizarre?"

This is of special interest to astrobiologists, who wonder about the likelihood that we are not alone. If life is eventually found elsewhere, Goldenfeld thinks we'll have a few things in common.

"The principles of universal biology should be applicable to all life irrespective of whether it is carbon chemistry-based or something stranger," he says.

Something stranger? Okay, so maybe that means they won't be in the phone book.

This article was originally published on www.astrobio.net. For the full article please visit <http://www.astrobio.net/exclusive/5416/digging-down-below-the-tree-of-life>. Photo by Don Hamerman. ■

IP @ IGB

Start-up Funding Sources

These are some common ways obtain seed funding for a start-up:

- SBIR/STTR – competitive awards from the Federal Government that encourage small businesses to develop innovative technologies. Phase I SBIR/STTR awards do not exceed \$150,000 and phase II SBIR/STTR awards do not exceed \$1,000,000. Both phases have project goals to meet during a defined time frame.

- Angel Investors – individuals who provide capital, often for a small amount of equity in the company. Angels should be deemed accredited investors by the Securities and Exchange Commission, and they often offer mentoring and advice in addition to capital. Individual Angels and Angel Networks can be found throughout the United States.
- Venture Capital – venture capital firms pool money from different sources (including wealthy individuals and institutional investors) which is then invested in a growing

company in exchange for some amount of equity. Although most venture capitalists invest in later-stage start-ups, a few do provide seed funding for new businesses.

- Crowd Funding – Crowd funding uses an internet platform to pitch ideas to the public. Anyone can donate money to a project, but the amount of funds raised through the crowd funding website will be limited by public interest. This funding source works better for small, less research-intensive projects. ■

Around the IGB

Register

2013 IGB Fellows Symposium



Register for the 2013 IGB Fellows Symposium, with special guest Michael Lynch, Distinguished Professor of Biology, Department of Biol-

ogy, Indiana University at Bloomington, on May 2, 2013.

Professor Lynch will give a talk entitled "The Drift-Barrier Hypothesis and the Evolution of Subcellular Features."

This full-day event is a chance to learn about IGB research, hear about current issues in the life sciences, and connect with other students on campus.

Don't forget to submit a poster for the poster session when you register - as always, prizes for the top three posters will be awarded, as well as raffle prizes for attendees.

Register now at <http://conferences.igb.illinois.edu/fellows/> ■

Awards

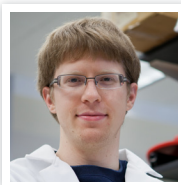
Bruce Fouke



Congratulations to Bruce Fouke, Professor of Geology, Director of the Roy J. Carver Biotechnology Center, and member of BCXT and EBI, for receiving the 2013 Campus

Award for Excellence in Undergraduate Teaching and 2013 LAS Dean's Award for Excellence in Undergraduate Teaching. ■

Brandon Burkhardt



Graduate student Brandon Burkhardt, chemical biology, who is a member of Professor Doug Mitchell's lab was recently awarded a Graduate Research Fellowship from the National

Science Foundation. This prestigious honor is awarded to outstanding graduate students in NSF-supported science, technology, engineering, and mathematics disciplines that are pursuing research-based master's and doctoral degrees at accredited United States institutions. ■

Register

Fifth Annual Energy Biosciences Institute Biofuels Law and Regulation Conference



The Fifth Annual Energy Biosciences Institute Biofuels Law and Regula-

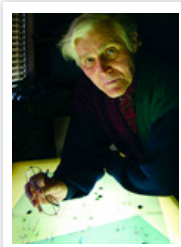
tion Conference, "Emerging Issues for Advanced Biofuel Commercialization," is a one-day conference bringing together the field's leading experts to explore the challenges in creating a bioenergy-based future.

The conference will be held at the I Hotel and Conference Center on Friday, April 19, 2013. The conference is sponsored by the Energy Biosciences Institute.

For more info and to register, please visit <http://www.biofuellawconference.org/> ■

Giving

Carl R. Woese Research Fund



Donations may be made to the Carl R. Woese Research Fund to support research on evolution, systems biology and ecosystem dynamics at the IGB. Dr. Woese approved this fund in his name to help the next generation

of scientists and to recognize his discoveries and work that have spanned nearly half a century at the U of I. Full details are available at <http://www.igb.illinois.edu/content/carl-r-woese-research-fund>. ■

CEM

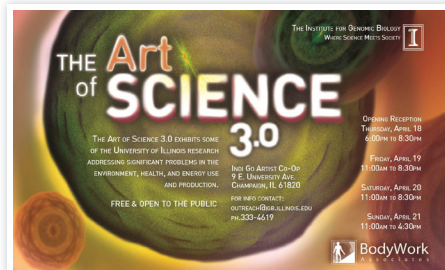
CEM Student Pitch Competition and Graduation

The Certificate in Entrepreneurship and Management (CEM) program will hold its student pitch competition and graduation on April 23 in 612 IGB. Student pitches will begin at 5:00 p.m., followed by a graduation ceremony and reception. Interested IGB members are encouraged to attend to see firsthand what the CEM program has to offer.

For more information on the CEM program, visit <http://www.igb.illinois.edu/ceb/> ■

Attend

Art of Science 3.0



In its third year, the 'Art of Science: Images from the Institute for Genomic Biology' is an event that successfully spans two divides; art and science, and town and gown. Research addressing significant problems in the environment, medicine, and energy use and production will be displayed.

The opening reception will take place on Thursday, April 18, from 6:00—8:30 p.m. at the Indi Go Gallery located at 9 E. University Avenue in Champaign. The exhibition will continue from 11:00 a.m.—8:30 p.m. on April 19 and 20, and from 11:00 a.m.—4:30 p.m. on April 21. ■

Social

Game Night



Thanks to all the volunteers who helped put together the latest IGB Game Night! Fun was had by all in competitive and family board games, with plenty of food and snacks to go around. ■

Social Committee Survey

The IGB Student Social Committee needs your input to continue to hold activities and events that build community at the IGB. Please complete the following anonymous five minute survey.

Surveys can be filled out at this address: <http://www.igb.illinois.edu/content/igb-social-committee-survey>

Thank you! ■

ADMINISTRATIVE NEWS

Business

FY14 Benefit Choice Enrollment for University of Illinois Employees

The FY14 Benefits Choice enrollment period will run from May 1, 2013 through May 31, 2013 with an effective date of July 1, 2013. The UIUC Benefits Center plans to send out information on the FY14 Benefit Choice options during the last week of April 2013. In preparation for the upcoming FY14 Benefits Choice enrollment period, University HR is advising employees to go online now to review their insurance benefit information.

The Illinois Department of Central Management Services (CMS) produces an online Benefit Statement that is updated the first Friday of each month to reflect employee and dependent coverage in effect on the first day of that month.

It is important to review this Statement annually and to confirm that your information and any changes you have requested to your coverage, address or biographical information are correct.

CMS also mails a Verification Form to employees after processing qualifying event or Benefit Choice changes. Employees should contact their campus

UPB Benefits office if information on either the Benefit Statement or Verification Form is incorrect.

To view your Benefit Statement, please visit:

<http://www2.illinois.gov/cms/Employees/benefits/StateEmployee/Pages/BenefitStatements.aspx>

Creation of an Illinois Public ID is required to view your Benefit Statement. Instructions for creating the ID are on the web page above. You will be asked for an email address when creating your ID which can be any email address you want to use to receive your ID validation.

Questions?

Send an email to benefits@uillinois.edu or contact your campus UPB Benefit Services at 217-333-3111. ■

University Library

Primo: A New Library Search Tool

The University Library is currently beta testing a new search tool – Primo (<http://go.library.illinois.edu/primo>). Primo is a “web-scale discovery tool” that searches across multiple resources and provides relevancy-ranked results in a single interface. Compared to the Library’s existing Easy Search tool that links out to results in individual resources, Primo provides results integrated into a single results set.

Primo provides access to much, but not all, of the University Library’s content. It includes content from a variety of databases and publishers, such as Web of Science, PubMed, PLoS, and the UIUC Library Catalog. It even includes some datasets from DataCite. Content from Scopus is not currently included, and results from the Library’s EBSCO databases are not fully integrated (They must be searched separately in Primo).

Primo offers some interesting features and functionality:

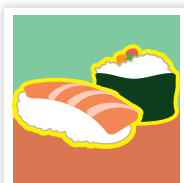
- Facilitates searching simultaneously for articles, books, digitized images, datasets, and more.

- Includes a yellow “custom tile” on the results page that provides context-specific links to popular databases and journals, comprehensive author searches, relevant library guides, the I-Share Statewide Online Catalog, and more.
- Groups together records of different editions or versions of books, CDs, DVDs, etc.
- Provides “facets” on the results page to refine search results by resource type, subject, date, and more.

If you have any questions or comments about Primo, please use the feedback form linked from Primo. The Library is very interested to hear users! And if you have questions about or need assistance with any library resources, feel free to contact Sarah Williams, Life Sciences Data Services Librarian, at scwillms@uillinois.edu. ■

Operations & Facilities

Sushi Thursdays at Array Cafe



Every Thursday at Array Cafe is Sushi Thursday, with a selection of fresh sushi available. Enjoy rolls of spicy tuna, california, smoked salmon, veggie, or try a variety roll if you can't decide. The cafe only orders enough for the day and almost always sells out, so be sure to stop by! ■

Communications

Seminar / Conference Website Checklist

Are you looking to develop an online presence for a seminar, conference, or other type of event hosted by the IGB, and need help organizing the info? We've provided a checklist to help guide the process to determine a URL, identify what content areas are needed, what information should be collected, and other helpful tips.

Located on the IGB website at <http://www.igb.illinois.edu/content/seminarconference-website-checklist> and also accessible via the home page under the Resources section, this guide can remove the confusion on what is required to create a site and help move your project forward. ■

Safety

Tornado Events: Know What To Do

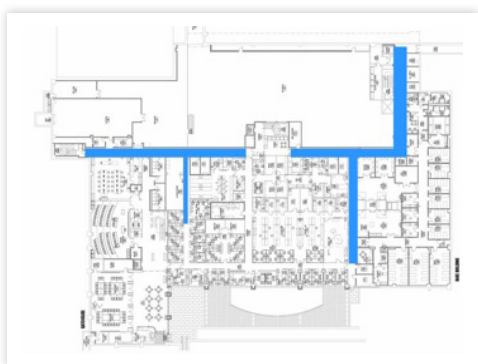
Tornado Watch: If the national weather service issues a tornado watch, this means weather conditions are right for the development of tornadoes. Remain alert for approaching storms and be prepared to seek shelter.

Tornado Warning: If the national weather service issues a tornado warning, this means that a tornado is imminent or has been indicated by Doppler radar or reported by storm spotters.

Tornado Sirens: Tornado sirens are sounded for those areas in the path of the tornado. These sirens are intended to be heard outside of the building but may not be audible to personnel inside of some buildings. The Illini alert system will send out an alert to all subscribed members if a tornado warning is issued for the University of Illinois campus area.

What to do if a tornado warning is issued for the U of I campus:

- Move to the designated tornado shelter area (see map). Assist those with special needs in getting to the shelter area.



» IGB designated tornado shelter area (Concourse level IGB)

- Put as many walls as possible between you and the outside. Use arms and hands to protect your head and neck. Stay away from windows and other sources of glass (large amounts of lab glassware).
- If you cannot get to the basement, go to an interior room on the lowest level away from windows and other glass.
- Get out of vehicles, trailers and mobile homes immediately. Go to the lowest floor of a sturdy nearby building or storm shelter.
- If caught outside with no shelter, lie flat in a nearby ditch or depression and cover your head with your hands. Be aware of potential flooding.
- Never try to outrun a tornado in a car or truck, leave the vehicle immediately for safe shelter. Tornadoes are erratic and can move swiftly.

Watch out for flying debris. Flying debris from tornadoes cause the most fatalities and injuries. ■

Recent Publications

Masyuko R, Lanni EJ, Sweedler JV, Bohn PW. Correlated imaging - a grand challenge in chemical analysis. *Analyst*. 2013;138(7):1924-1939.

Mikel MA. Ancestry and characterization of U.S. contemporary proprietary garden pea (*pisum sativum* L. convar. *medullare* alef.) germplasm. *Genet Resour Crop Evol*. 2013;1-11.

Gargi A, Tamilselvam B, Powers B, et al. Cellular interactions of the cytolethal distending toxins from *escherichia coli* and *haemophilus ducreyi*. *J Biol Chem*. 2013;288(11):7492-7505.

Dunbar KL, Mitchell DA. Revealing nature's synthetic potential through the study of ribosomal natural product biosynthesis. *ACS Chem Biol*. 2013;8(3):473-487.

Day FP, Schroeder RE, Stover DB, et al. The effects of 11 yr of CO₂ enrichment on roots in a florida scrub-oak ecosystem. *New Phytol*. 2013.

Gonnerman MC, Benedict MN, Feist AM, Metcalf WW, Price ND. Genomically and biochemically accurate metabolic reconstruction of *methanosarcina barkeri fusaro*, iMG746. *Biotechnol J*. 2013.

Wei N, Xu H, Kim SR, Jin YS. Deletion of FPS1 coding for aquaglyceroporin Fps1p improves xylose fermentation by engineered *saccharomyces cerevisiae*. *Appl Environ Microbiol*. 2013.

Slater S, Setubal JC, Goodner B, et al. Reconciliation of sequence data and updated annotation of the genome of *agrobacterium tumefaciens* C58, and distribution of a linear chromosome in the genus *agrobacterium*. *Appl Environ Microbiol*. 2013;79(4):1414-1417.

Delfino KR, Rodriguez-Zas SL. Transcription factor-MicroRNA-target gene networks associated with ovarian cancer survival and recurrence. *PLoS ONE*. 2013;8(3).

Feng Y, Zhang H, Cronan JE. Profligate biotin synthesis in α -proteobacteria - a developing or degenerating regulatory system? *Mol Microbiol*. 2013.

Branscomb E, Russell MJ. Corrigendum to "turnstiles and bifurcators: The disequilibrium converting engines that put metabolism on the road" [biochim. biophys. acta 1827 (2013) 62-78] (DOI:10.1016/j.bba-bio.2012.10.003). *Biochim Biophys Acta Bioenerg*. 2013.

Smith CM, David MB, Mitchell CA, et al. Reduced nitrogen losses after conversion of row crop agriculture to perennial biofuel crops. *J Environ Qual*. 2013;42(1):219-228.

Su X, Han Y, Dodd D, et al. Reconstitution of a thermostable xylan-degrading enzyme mixture from the bacterium *caldicellulosiruptor bescii*. *Appl Environ Microbiol*. 2013;79(5):1481-1490.

Amato KR, Yeoman CJ, Kent A, et al. Habitat degradation impacts black howler monkey (*alouatta pigra*) gastrointestinal microbiomes. *ISME J*. 2013.

Fazal Z, Southey BR, Sweedler JV, Rodriguez-Zas SL. Multifactorial understanding of ion abundance in tandem mass spectrometry experiments. *J Proteomics Bioinformatics*. 2013;6(2):23-29.

Ha S-, Kim H, Lin Y, et al. Single amino acid substitutions in HXT2.4 from *scheffersomyces stipitis* lead to improved cellobiose fermentation by engineered *saccharomyces cerevisiae*. *Appl Environ Microbiol*. 2013;79(5):1500-1507.