



IGBNEWS

Achievements, awards, and information about the IGB community

Volume 6, Number 2



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Upcoming Events

IGB Seminar

March 12, 2013

12:00 p.m.

612 Institute for Genomic Biology

Rachel Smith-Bolton, PhD

Assistant Professor, Cell and Developmental Biology

University of Illinois, Urbana-Champaign

“Regulation of Signaling, Patterning and Cell Fate during Regenerative Growth”

Pioneers in Genomic Biology Lecture Series

April 2, 2013

12:00 p.m.

612 Institute for Genomic Biology

Wing Wong, PhD

Professor, Department of Statistics and Health Research and Policy

Stanford University

Title to be announced

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

Save the date for an event that represents fulfilling all three of the University of Illinois' missions: public engagement, research, and education.

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

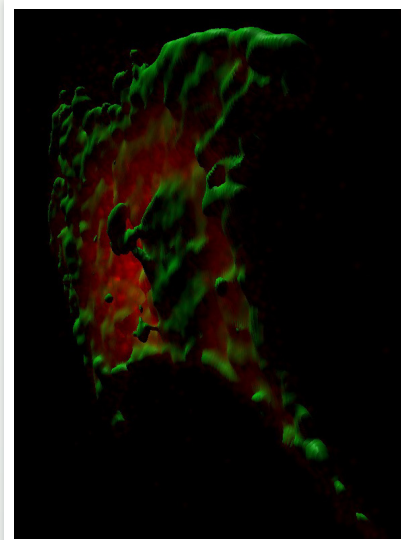
1900 S. First St., Champaign

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”

Image of the Month



This month's image, “Mammalian Cell Bio-sensor,” is courtesy of John Eichorst of the Robert Clegg Lab.

This image was taken using the Zeiss 710 with ISS fluorescence lifetime imaging microscope.

IGB News

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

Bruce Fouke: Helping Search for Early Life

Bruce Fouke's career as a geologist was profoundly changed at the moment he first met internationally acclaimed microbiologist Carl Woese, whom he met in 1997. Having read that microbes may impact the most fundamental geochemical cycles within the world's oceans and continents, Fouke, a carbonate sedimentologist, was eager to meet microbiologists interested in collaborating in his studies of coral reefs and hot springs.

"I arrived on the Illinois campus in August of 1997 and met Carl that first week," remembers Fouke. "I shared my ideas with him about investigating the role of microbes in sedimentation and mineral precipitation. He responded, 'I like your thoughts, but I'm not going to introduce you to microbiologists. Instead, I will help you and your students to learn the basics of microbiology and complete the research yourselves.' Those words changed the course of my life."

Fouke apprenticed himself to Woese (who passed away December 30, 2012, at the age of 84) and to Abigail Salyers, another exceptionally accomplished microbiologist at Illinois. They helped him hire postdoctoral researchers with microbiology PhDs and to find some unoccupied lab space. Eventually Fouke received two important grants that helped him study the role of microbes in forming travertine deposits at Mammoth Hot Springs in Yellowstone National Park and to study emerging infectious diseases in coral reef ecosystems throughout the world. His growing success enabled Fouke to build a molecular geobiology laboratory in the Department of Geology, which he recently moved into the Institute for Genomic Biology.

Because Fouke's systems geobiology projects have depended on integrated metagenomics, proteomics and bioinformatics, he has been a regular client of the Roy J. Carver Biotechnology Center (CBC) at Illinois. Therefore, when Jonathan Sweedler stepped down as Director of the CBC after ten years, Fouke was a natural choice to replace him in November 2012. The CBC pro-



» Bruce Fouke takes a sample at Mammoth Hot Springs in Yellowstone National Park, part of his work to study the process of microbial fossilization. Photo by Tom Murphy.

vides state-of-the-art, high-throughput sequencing, bioinformatics and biochemical analyses to more than 221 principal investigators on campus representing six colleges and 38 departments, as well as numerous off-campus projects. Fouke is happy to take on this new responsibility, with the interdisciplinary nature of the CBC strongly appealing to him.

"I have the kind of research program and personality that thrive on having friends and colleagues all across campus," he says. "The CBC gives me an opportunity to continue and even expand on that."

Today Fouke spends much of his time at the IGB. As a founding member of the IGB Biocomplexity theme, his work in better understanding the role of ancient microbes in sedimentation by applying metagenomic tools dovetails nicely with other researchers in that group looking for clues about early life. Fouke and his colleagues in that theme have just received a five-year, \$8 million award from the NASA Astrobiology Institute (NAI). The grant will study the origin and evolution of life, with emphasis on the archaea. The University of Illinois is one of only five teams that were funded in the 2012 competition, which takes place every four years.

The Illinois NAI scientists believe that the early evolution of life took place in an extreme world that was very different from much of Earth today. It was a hostile world of hot temperatures, acidic conditions, and little to no oxygen. Researchers have wondered if perhaps environments with these harsh conditions would speed up evolution. This idea that the rate of evolution is not static is a relatively new concept, says Fouke. The Illinois NAI team will use their expertise on the microbial life of hot springs to shed light on the tempo and

mode of microbial evolution in the face of steep environmental gradients. Their work will test the theory that early life may have evolved in places similar to hot springs, with their remarkably steep gradients of pH and temperature.

The NASA grant also will investigate Woese's theory that the earliest living cell, which had no translation machinery, may have contained some

“We’re starting to see things we never guessed, suggesting some basic cell function and metabolic capabilities were first worked out in archaea and then transferred to bacteria and even eukaryotes.”

basic molecular components and a cell wall. This progenote, as Woese christened it, then evolved quickly into all three forms of life—archaea, bacteria and eukaryotes—almost simultaneously.

"It's exciting that we can now conduct controlled experimentation on these incredibly fundamental questions that Carl initially proposed," says Fouke. "We're starting to see things we never guessed, suggesting some basic cell function and metabolic capabilities were first worked out in archaea and then transferred to bacteria and even eukaryotes. This is consistent with the notion that archaea, bacteria and eukaryotes evolved around the same time."

As part of the NASA grant Fouke also will lead a strong educational and public outreach program.

Monthly Feature

This will include development of two new LAS Online courses, and a series of short science education videos ("SciFlix") in coordination with middle and high schools around the country and in Europe. The NAI team will also bring 100 middle school students and their teachers to observe first-hand the extreme thermal environments of Yellowstone National Park. Fouke will organize programs at the Illinois Osher Lifelong Learning Institute (OLLI) as well.

Fouke's research group is also using metagenome-enabled techniques to understand how coral are adapted to higher sea levels. As water temperatures rise and ice caps melt, coral are in danger of "drowning;" they will be too far from the surface for the algae that live in their tissue to photosynthesize. But Fouke has found that when the temperature rises, coral express different classes of proteins to help their skeletons grow faster, raising them close enough to the water surface that sunlight can reach them.

This is not the first time coral have had to adapt

like this, Fouke points out. It's a crisis they've had to live through before. One of the first multi-cell eukaryotes with a skeleton (542 million years before present) was closely related to corals. Over this long period of time, sea surface temperatures reached significantly higher levels than they are on the modern day Earth.

However, while corals may be able to adapt to rising temperatures and sea levels, they are also struggling with new physical, chemical and biological threats created by human activity. For example, Fouke is looking at how corals respond to increasing coral disease by examining gene expression within a holistic geobiological context.

Yet another outlet for the Fouke lab group in genomics and sedimentation is the study of the history of ancient Roman aqueducts. The aqueducts, with their regular flow of spring water from the Italian Apennines, provided a highly controlled environment in which travertine rock deposition took place. In fact, travertine deposition reached four meters in thickness in some aqueducts,

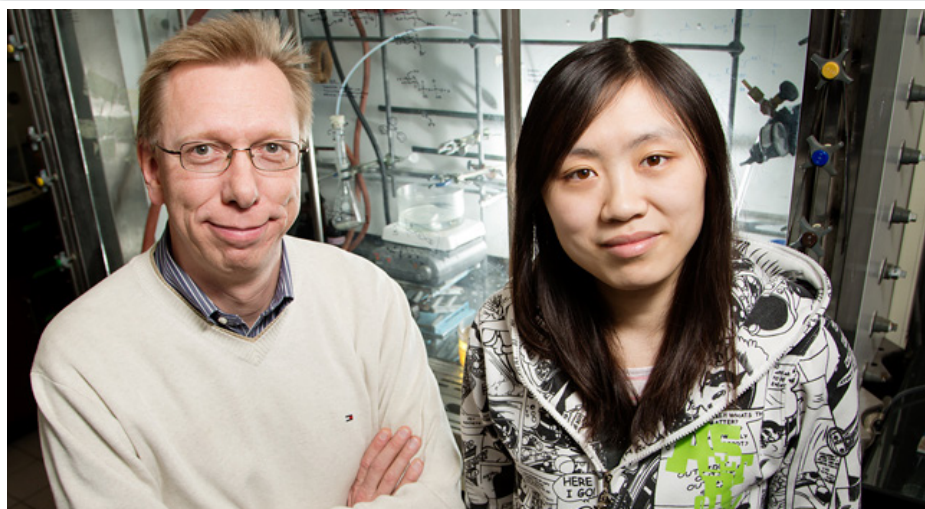
and provided a prized source for high-quality travertine in Roman temples and monuments. Using analyses they developed to study hot spring travertine deposition in Yellowstone, the Fouke lab group has been able to reconstruct the timing, temperature, chemistry, flow and microbiological composition of the ancient aqueduct waters from the aqueduct travertine deposits.

For example, archaeologists had theorized that the aqueducts fell into disuse when the Ostrogoths besieged Rome in 537 A.D. The Fouke lab's integrated use of geological, chemical and microbiological analyses indicates that water flowed in the aqueducts until as late as 950 A.D. "We may have upset a few archaeologists with our findings," he acknowledges, smiling.

But people tend to find it hard to stay upset with Fouke, whose sunny demeanor and outsize personality make him well known across campus. Those traits, plus his enthusiasm for interdisciplinary work, make him welcome in the many fields he has ventured into. ■

Research

Study: Odd Biochemistry Yields Lethal Bacterial Protein



» Chemistry professor and IGB faculty Wilfred van der Donk, left, and graduate student Weixin Tang determined the unusual structure of a bacterial toxin.

While working out the structure of a cell-killing protein produced by some strains of the bacterium *Enterococcus faecalis*, researchers stumbled on a bit of unusual biochemistry. They found that a single enzyme helps form distinctly different,

three-dimensional ring structures in the protein, one of which had never been observed before.

The new findings, reported in *Nature Chemical Biology*, should help scientists find new ways to target the enterococcal cytolyisin protein, a "viru-

lence factor that is associated with acute infection in humans," said University of Illinois chemistry and Institute for Genomic Biology professor Wilfred van der Donk, who conducted the study with graduate student Weixin Tang.

Enterococcus faecalis (EN-ter-oh-cock-us faye-KAY-liss) is a normal microbial inhabitant of the gastrointestinal tracts of humans and other mammals and generally does not harm its host. Some virulent strains, however, produce cytolyisin (sigh-toe-LIE-sin), a protein that, once assembled, attacks other microbes and kills mammalian cells.

"The cytolyisin protein made by *Enterococcus faecalis* consists of two compounds that have no activity by themselves but when combined kill human cells," van der Donk said. "We know from epidemiological studies that if you are infected with a strain of *E. faecalis* that has the genes to make cytolyisin, you have a significantly higher chance of dying from your infection." *E. faecalis* contributes to root canal infections, urinary tract infections, endocarditis, meningitis, bacteremia and other infections.

Enterococcal cytolyisin belongs to a class of antibiotic proteins, called lantibiotics, which have two or more sulfur-containing ring structures. Scientists had been unable to determine the three-dimensional structure of this cytolyisin because the bacterium produces it at very low concentrations. Another problem that has stymied researchers is that the two protein components of cytolyisin tend

Monthly Feature

to clump together when put in a lab dish.

Van der Donk and Tang got around these problems by producing the two cytolysin components separately in another bacterium, *Escherichia coli* (esh-uh-REE-kee-uh KOH-lie), and analyzing them separately.

"The two components are both cyclic peptides, one with three rings and the other with two rings," van der Donk said. "Curiously, a single enzyme makes both compounds."

In a series of experiments, the researchers found that one ring on each of the proteins adopted a (D-L) stereochemistry that is common in lantibiotics. But the other rings all had an unusual (L-L) configuration, something van der Donk had never seen before.

Scientists had assumed that the enzyme that shaped enterococcal cytolysin, a lantibiotic synthetase, acted like a three-dimensional mold

that gave the ring structures of cytolysin the exact same stereochemistry, van der Donk said.

"But we found that the enzyme, enterococcal cytolysin synthetase, makes the rings with different stereochemistry," he said. "I don't know of any other examples where one enzyme can make very similar products but with different stereochemistries."

The researchers don't know how the enzyme accomplishes this feat, but found a clue in the sequence of amino acids that make up the protein rings. The chemical characteristics of the three amino acids in the middle of the ring structure and their proximity to another amino acid, a cysteine, determined whether the rings took on a D-L or L-L stereochemistry.

The researchers tested the idea that the amino acid sequence of the cytolysin protein was guiding the stereochemistry by looking at other

lantibiotic proteins with similar sequences. So far, every protein they've tested that has the same sequence characteristics conforms to the pattern they discovered, van der Donk said.

Further tests showed that the cytolysin produced in *E. coli* had the same anti-microbial and cell-killing potency as the *E. faecalis* variety.

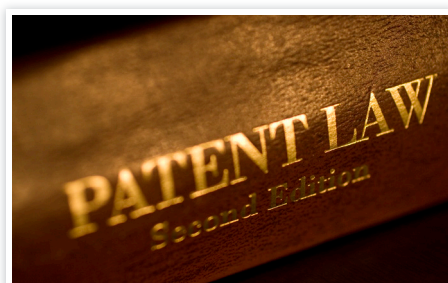
"Knowing the structure of enterococcal cytolysin and having a method to produce it in relatively large quantities will allow scientists to find out how it kills human cells and, in turn, how we might fight against it," van der Donk said.

The National Institutes of Health supported this research. Van der Donk also is a Howard Hughes Medical Institute investigator.

Story by Diana Yates. Photo by L. Brian Stauffer. ■

IP @ IGB

Patience and the Patent Office



The time that passes from when an inventor submits a patent application to having a granted patent can seem like an eternity. This article explains briefly what happens between submission and granting of a patent application and why patience is necessary in this process.

When a patent application is sent to the United States Patent and Trademark Office it is assigned to a patent examiner who focuses on a narrow spectrum of technologies. After reviewing the patent application and searching the prior art, the examiner will release an office action. Often this first office action is a non-final action that explains any rejection of or objection to certain claims. Claims can be rejected or objected to when subject matter is considered unpatentable due to:

- non-statutory subject matter- what is claimed is not a useful process, manufacture, composition of matter or machine

- anticipation - one reference with a publication date prior to the application's filing date teaches each and every aspect of the claimed invention
- obviousness - more than one reference with a prior publication date renders the claim obvious to someone skilled in the art
- inadequate written description and/or enablement of the claims

If the office action is non-final, the applicant can respond to the patent examiner with corrections or stipulations. The patent examiner considers these responses and releases another office action. This cycle is continued until a final office action is released. The final office action will either grant or deny the patent application. Currently, the USPTO reports that there is an average of 2.5 office actions per patent application.

At the time of writing, the average period required to process a patent application from submission to final office action is 31.4 months. A significant portion of this time is the average 19.2 months that lapse prior to releasing the first office action. Some of this time lag is due to the 597,000 backlogged patent applications, which is an improvement over the all-time high of 721,831 backlogged applications in December 2010. Although progress is being made on this backlog it is slow because the number of completed application examinations is not much larger than the number of filed patent applications. For example, in fiscal year 2011, 533,943 patent applications had final

office actions released, but 536,604 new applications were filed.

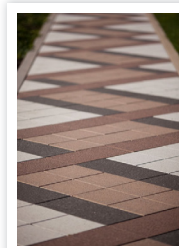
Information about office actions on specific patent applications being reviewed by patent examiners can be found at the USPTO Patent Application Information Retrieval website: <http://portal.uspto.gov/external/portal/pair/>

More statistics from the USPTO are available on its Patents Dashboard Website: <http://www.uspto.gov/dashboards/patents/main.dashxml> ■

Around the IGB

Giving

Walk of Life



Contributing to the Walk of Life is a unique opportunity to simultaneously support our mission and become a permanent part of IGB history. Commemorate a special event, like graduation.

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

Around the IGB

New Theme

Gene Networks in Neural & Developmental Plasticity



The IGB has a new research theme, Gene Networks in Neural & Developmental Plasticity, or GNDP. This theme seeks to understand the structures of conserved

regulatory networks and how modifications to those networks can explain biological diversity both between and within species.

GNDP will be led by Professor of Cell and Developmental Biology and IGB faculty member Lisa Stubbs, who formerly served as the interim theme leader of the Genomics of Neural & Behavioral Plasticity research theme. ■

IGB Fellowship

Become an IGB Fellow

The IGB offers a number of fellowships for truly exceptional young scholars who have completed their Ph.D. within the last several years, and are looking for a stimulating and supportive interdisciplinary environment to carry out independent and collaborative research in the field of genomic biology. IGB Fellows will spend up to three years conducting research in one of several research themes in the Institute, and ideally this research will also overlap with two or more of these thematic areas.

We are now accepting applications for new Fellows. Please fill out the application form at <http://www.igb.illinois.edu/content/fellows-application> ■

CEM

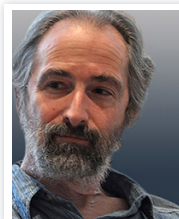
CEM Student Pitch Competition and Graduation

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/ce/> ■

Register

2013 IGB Fellows Symposium



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

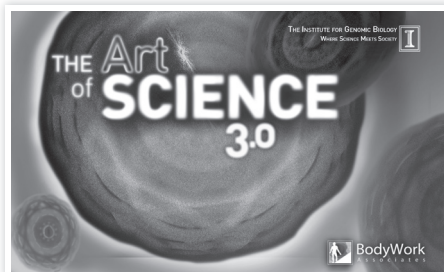
This full-day event is a chance to learn about IGB research, hear about current issues in the life sciences, and connect with other students on campus.

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/> ■

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. ■

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/> ■

Results

Bake-off and Culinary Competition Winners



Thanks to all the bakers and chefs who submitted items. Kudos to the volunteers!

Overall Best Sweet

Raspberry Cheesecake Bars - Courtney Cox, MMG

Best Cupcake

Cookie Dough Frosted Brownie Cupcakes - Mike Masters, GEGC

Best Cake

Fat Elvis Cake (pictured above) - Luke Fenlon, HMS

Best Other Sweet

Twix Bars - Debbie Piper, BCXT

Best Savory

Super Plain Meatballs - Melissa McKillip, Admin

Theme with the most number of submissions
GEGC ■

ADMINISTRATIVE NEWS

Business

TEM User Group Webinar: “Airfare, T-Card & Contracted Travel Agencies... Why must we use them?”



Date: Mar 27, 2013
Time: 1:30 pm - 2:30 pm
Sponsor: OBFS Training
Registration:
To register, please go to the TEM
Registration page link below and click

on the course name on the left.

<http://training.obfs.uillinois.edu/index.cfm?campus=o>

Webinar Description:

University Payables will host an online “TEM: User Group Webinar” on the fourth Wednesday of each month. These sessions will provide system users with tips on how to process reviews and topic-specific discussions derived from user concerns and questions. Users may email additional topic suggestions, questions, and concerns to TEMUsergroup@uillinois.edu. The deadline for submission is 2 weeks prior to each webinar date. University Payables will review submissions and distribute an agenda prior to each webinar.

TEM Open Lab Sessions

This is a great opportunity to get hands on experience and work out your problems with a UPay Expert! **Space is limited, please sign up today.**

Dates:

March 19, 2013, 9:30am-11:30am

April 16, 2013, 1:30pm-3:30pm

May 9, 2013, 1:30pm-3:30pm

May 21, 2013, 9:30am-11:30am

June 11, 2013, 1:30pm-3:30pm

Course Description:

Are you live with the TEM System? Have you created Expense Reports or gone through the Review/Approve steps and need additional assistance with specific processes? If so, register and attend a TEM Open Lab and work out your problems with a UPay Expert!

The Open Lab is not a training session. This session is available to those currently live and working in TEM and is designed to help you with your specific issues with the System. If you are interested in attending an Open Lab, the following are requirements for admission:

- You must be live in the TEM System and set up with a login
- You must bring documents or Expense Report numbers to process or discuss
- You must be familiar with the TEM Resource Page
- You must register for the TEM Open Lab
- You must enter your specific questions in the comment box, located under the date options, within this Course Registration Page

The TEM Open Lab is not a training session and is only available to those who are live with TEM. If you are not currently using TEM, please wait until you go live and experience the benefits of the system before attending a TEM Open Lab.

The TEM Resource Page: <http://www.obfs.uillinois.edu/tem-resources/>

Location:

Fire Service Institute, Room 1040
11 Gerty Drive, Building 1261, MC-675
Champaign, IL 61820

Attendees may park in the Fire Service Institute parking lot at no charge. ■

Operations & Facilities

Conference Room

Conference Room 3000 is available for reservations via the IGB space request form at <http://www.igb.uillinois.edu/facilities-services/igb-conference-space-request-form>. Questions? Contact space@igb.uiuc.edu.

Array Cafe

Visit Array Cafe and try our new spring menu! New additions include a BLT salad, couscous salad, cranberry chicken salad sandwich on whole wheat and baked oatmeal. Sushi is still available every Thursday and we offer meat-less Friday options during Lent. Like us on Facebook for a chance to win a St. Patrick's Day goodie bag full of cookies, a hot or cold cup and free drink tokens! ■

CNRG

New Poster Printer Available



CNRG has maintained a poster printer that dates back to before the building was occupied, and it has served the IGB faithfully for many years. However replacement parts were becoming fairly expensive so when it recently started to fail, it was decided to purchase a new system.

The new printer is a Canon imagePROGRAF iPF9400, with several advantages over the older system. The printer features 12 inks versus only 6 of the previous printers, and allows faster printing, automatic color calibration for truer color, and a paper width of 60 inches (the older system was limited to 42 inches).

CNRG will continue to offer printing on all the former papers and sizes, and the poster submission form will automatically determine the most cost-efficient option between 60 inch or 42 inch paper.

Visit <http://www-app.igb.uiuc.edu/posterprinter/> to view the poster submission form, also available on the IGB home page under the IGB Resources dropdown in the Spotlight section. ■

University Library

DataUp: A Data Management Tool for Excel

DataUp (<http://dataup.cdlib.org/>) is described as “an open source tool helping researchers document, manage, and archive their tabular data. DataUp operates within the scientist’s workflow and integrates with Microsoft Excel.” It is available as a web application and as an Excel add-in/plugin. DataUp is a project of the California Digital Library, and it is currently in beta.

DataUp’s main features:

- Checks .xlsx or .csv files for issues that do not follow data management best practices, such as special characters, columns with mixed data types, and missing header rows
- Guides users through the creation of standardized metadata that describes the data at the file or column level
- Helps users obtain identifiers for their datasets
- Allows datasets to be deposited in a repository; DataUp is connected to the ONEShare repository, which is a DataONE member node

If you want to learn more and experiment, the DataUp site includes videos that demonstrate the web application and add-in versions. The site also provides a sample Excel file that showcases the best practices check, and a practice repository that allows you to create a temporary identifier and practice depositing a dataset.

If you have questions about DataUp or other data management resources, feel free to contact Sarah Williams, Life Sciences Data Services Librarian, at scwillms@illinois.edu. ■

Safety

University Department of Public Safety Trains IGB Administration on New Building Action Plan

On February 28th, Lieutenant Todd Short from the University of Illinois Police Department gave a one hour training session on aspects of the new IGB Building Emergency Action Plan (BEAP). This new plan emphasizes that staff only have to make two decisions when disaster strikes. Those two decisions are **stay in** (shelter in place) or **get out** (evacuate in a safe and orderly manner).

If you must evacuate you should know that the primary evacuation meeting location is on the sidewalk in front of the Morrow plots. **Do not evacuate on to the plaza**, the plaza is still considered part of the building since it is essentially the roof of the concourse floor.

The secondary meeting location is the 1st floor of the parking garage on the corner of South Dornier Drive and West Gregory Drive. This is the location where IGB staff would go if there is inclement weather, or if the sidewalk in front of the Morrow plots is otherwise unavailable or unsafe. If you need to “stay in” or shelter in place, find a room that has a solid locking door. Avoid rooms or doors with large amounts of glass. Look for a room with a door made of solid wood or metal with the ability to lock from the inside. You may also want to barricade the door by moving chairs or heavy furniture in front of them to help secure the room.

In addition to the final approval of the building emergency action plan, IGB Facilities will be adding evacuation floor plans to each floor. These will be detailed maps indicating locations of exits, areas of rescue assistance, fire extinguishers and fire alarm activation pull stations. The floor plans will be located near the reception desks in each theme and near the elevator. For more information you can contact Bob Mann, IGB safety Coordinator at bobmann@illinois.edu or visit the IGB safety web page (<http://www.igb.illinois.edu/safety>) and the University of Illinois Department of Public Safety web page (<http://www.dps.uiuc.edu/>). ■

Recent Publications

Lin L-, Grimme JM, Sun J, et al. The antagonistic roles of PDGF and integrin $\alpha\beta3$ in regulating ROS production at focal adhesions. *Biomaterials*. 2013.

Levy-Assaraf M, Voronov-Goldman M, Rozman Grinberg I, et al. Crystal structure of an uncommon cellulosome-related protein module from *ruminococcus flavefaciens* that resembles papain-like cysteine peptidases. *PLoS ONE*. 2013;8(2).

de Souza AP, Arundale RA, Dohleman FG, Long SP, Buckeridge MS. Will the exceptional productivity of *miscanthus x giganteus* increase further under rising atmospheric CO₂? *Agric For Meteorol*. 2013;171-172:82-92.

Ishida Y, Georgiadis NJ, Hondo T, Roca AL. Triangulating the provenance of African elephants using mitochondrial DNA. *Evol Appl*. 2013;6(2):253-265.

Gray SB, Strellner RS, Puthuval KK, et al. Minirhizotron imaging reveals that nodulation of field-grown soybean is enhanced by free-air CO₂ enrichment only when combined with drought stress. *Funct Plant Biol*. 2013;40(2):137-147.

Collins III JJ, Wang B, Lambrus BG, Tharp ME, Iyer H, Newmark PA. Adult somatic stem cells in the human parasite *schistosoma mansoni*. *Nature*. 2013.

Lee W-, Kim M-, Jin Y-, Seo J-. Engineering of NADPH regenerators in *escherichia coli* for enhanced biotransformation. *Appl Microbiol Biotechnol*. 2013:1-12.

Abdel-Hamid AM, Solbiati JO, Cann IKO, eds. Insights into lignin degradation and its potential industrial applications. ; 2013 *Advances in Applied Microbiology*; No. 82.

Zavala JA, Nabity PD, DeLucia EH, eds. An emerging understanding of mechanisms governing insect herbivory under elevated CO₂. ; 2013 *Annual Review of Entomology*; No. 58.

Kim B, Du J, Eriksen DT, Zhao H. Combinatorial design of a highly efficient xylose-utilizing pathway in *saccharomyces cerevisiae* for the production of cel-lulosic biofuels. *Appl Environ Microbiol*. 2013;79(3):931-941.

Sadeque A, Seroo NVL, Southey BR, Delfino KR, Rodriguez-Zas SL. Identification and characterization of alternative exon usage linked glioblastoma multiforme survival. *BMC Med Genomics*. 2012;5:59.

Kim SR, Lee K-, Kong II, et al. Construction of an efficient xylose-fermenting diploid *saccharomyces cerevisiae* strain through mating of two engineered haploid strains capable of xylose assimilation. *J Biotechnol*. 2013.



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