



IGBNEWS

Achievements, awards, and information about the IGB community

Volume 5, Number 3



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{Upcoming Events}

Innovation and Commercialization Seminar

April 17, 2012

12:00 p.m.

612 Institute for Genomic Biology

Xiaomin Yang, Ph.D.

Technology Transfer Manager

BP Biofuels North American, LLC

“Technology and Business Integration”

IGB Game Night

April 20, 2012

4:00 p.m.—6:00 p.m.

IGB Concourse Level

The IGB Social Committee is sponsoring a game night. Families are welcome!

Pioneers in Genomic Biology Lecture Series

April 24, 2012

12:00 p.m.

612 Institute for Genomic Biology

Allan S. Hoffman, ScD

*Professor Emeritus of Bioengineering,
University of Washington*

“The Origins and Evolution of Controlled Drug Delivery Systems (DDS)”

Fourth Annual EBI Biofuels Law and Regulation Conference

April 25, 2012

8:00 a.m.—5:00 p.m.

I Hotel and Conference Center

1900 S. First Street, Champaign, IL 61820

“Focusing in on the Renewable Fuel Standard (RFS2)”

IGB Special Seminar

May 3, 2012

4:00 p.m.—5:00 p.m.

612 Institute for Genomic Biology

C. Victor Jongeneel, PhD

Director, High-Performance Biological Computing (HPCBio)

Adjunct Professor of Bioengineering, UIUC

“Partnering with the Genomics X-Prize: Genomics and Large-Scale Computing”

2012 IGB Fellows Symposium

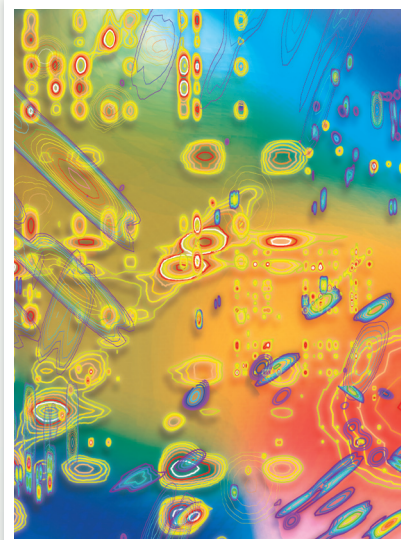
May 3, 2012

8:30 a.m.—3:30 p.m.

612 Institute for Genomic Biology

Learn about IGB research, hear about current issues in the life sciences, and connect with other students on campus at the sixth annual IGB Fellows Symposium. Register today!

{Image of the Month}



This month's image, “Two-Dimensional NMR Spectrum” was submitted by Xudong Guan of the IGB Core Facilities, taken with the Agilent 600 MHz NMR.

Multidimensional NMR spectra are very powerful in structural elucidation of organic compounds and proteins, and for studying the interactions between drug molecules and target proteins.

IGB News

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

Insects Have Personalities Too, Research on Honey Bees Indicates

A new study in Science suggests that thrill-seeking is not limited to humans and other vertebrates. Some honey bees, too, are more likely than others to seek adventure. The brains of these novelty-seeking bees exhibit distinct patterns of gene activity in molecular pathways known to be associated with thrill-seeking in humans, researchers report.

The findings offer a new window on the inner life of the honey bee hive, which once was viewed as a highly regimented colony of seemingly interchangeable workers taking on a few specific roles (nurse or forager, for example) to serve their queen. Now it appears that individual honey bees actually differ in their desire or willingness to perform particular tasks, said Institute for Genomic Biology director and University of Illinois entomology professor Gene Robinson, who led the study. These differences may be due, in part, to variability in the bees' personalities, he said.

"In humans, differences in novelty-seeking are a component of personality," he said. "Could insects also have personalities?"

Robinson worked with colleagues, including research student Zhengzheng Sophia Liang and IGB affiliate and Animal Sciences Professor Sandra Rodriguez-Zas, to study two behaviors that looked like novelty-seeking in honey bees: scouting for nest sites and scouting for food.

When a colony of bees outgrows its living quarters, the hive divides and the swarm must find a suitable new home. At this moment of crisis, a few intrepid bees—less than 5 percent of the swarm—take off to hunt for a hive.

These bees, called nest scouts, are on average 3.4 times more likely than their peers to also become food scouts, the researchers found.

"There is a gold standard for personality research and that is if you show the same tendency in different contexts, then that can be called a personal-



» Researchers found that some bees have novelty-seeking personalities.

ity trait," Robinson said. Not only do certain bees exhibit signs of novelty-seeking, he said, but their willingness or eagerness to "go the extra mile" can be vital to the life of the hive.

The researchers wanted to determine the molecular basis for these differences in honey bee behavior. They used whole-genome microarray analysis to look for differences in the activity of thousands of genes in the brains of scouts and non-scouts.

"People are trying to understand what is the basis of novelty-seeking behavior in humans and in animals," who Robinson, who also is affiliated with the Neuroscience Program at Illinois. "And a lot of the thinking has to do with the relationship between how the (brain's) reward system is engaged in response to some experience."

The researchers found thousands of distinct differences in gene activity in the brains of scouting and non-scouting bees.

“ In humans, differences in novelty-seeking are a component of personality. Could insects also have personalities? ”

"We expected to find some, but the magnitude of the differences was surprising given that both scouts and non-scouts are foragers," Robinson said.

Among the many differentially expressed genes were several related to catecholamine, glutamate and gamma-aminobutyric acid (GABA) signaling, and the researchers zeroed in on these because

they are involved in regulating novelty-seeking and responding to reward in vertebrates.

To test whether the changes in brain signaling caused the novelty-seeking, the researchers subjected groups of bees to treatments that would increase or inhibit these chemicals in the brain.

Two treatments (with glutamate and octopamine) increased scouting in bees that had not scouted before. Blocking dopamine signaling decreased scouting behavior, the researchers found.

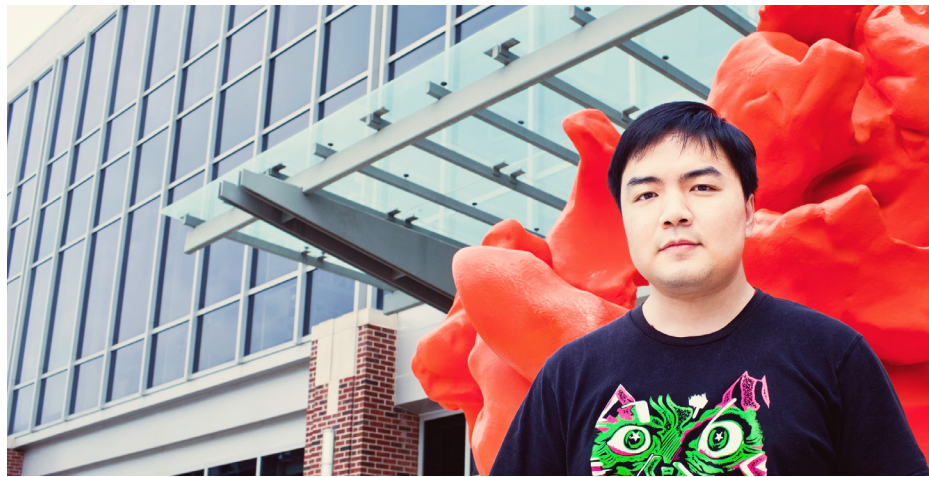
"Our results say that novelty-seeking in humans and other vertebrates has parallels in an insect," Robinson said. "One can see the same sort of consistent behavioral differences and molecular underpinnings."

The findings also suggest that insects, humans and other animals made use of the same genetic "tool kit" in the evolution of behavior, Robinson said. The tools in the tool kit—genes encoding certain molecular pathways—may play a role in the same types of behaviors, but each species has adapted them in its own, distinctive way.

"It looks like the same molecular pathways have been engaged repeatedly in evolution to give rise to individual differences in novelty-seeking," he said.

The National Science Foundation, National Institutes of Health and Illinois Sociogenomics Initiative supported this research. Support was also provided by Bruce Schatz, PI of the Beespace Project, funded by a NSF Frontiers in Biological Research grant.

Collaborators on this study included researchers from Wellesley College and Cornell University. ■



Jian Ma Working to Manage “Data Deluge”

The first effort to sequence the human genome cost \$3 billion and took more than a decade when it was launched in 1990. Today, with sequencing technology both faster and cheaper, \$1,000 genomes are now on the horizon.

In addition, the number of organisms being sequenced is skyrocketing. For example, the G10K project, which has the goal to sequence 10,000 vertebrates, and 15K (5,000 insect genome sequences) are two ambitious projects made possible by these technological developments.

But with all that data comes another challenge: how to analyze it all.

“The availability of all that information, especially in recent years as the sequencing price dropped and throughput was higher, has resulted in a data deluge,” says Jian (“JEE-on”) Ma, assistant professor of bioengineering and a member of the Cellular Decision Making in Cancer theme in the IGB.

Never fear. Ma, who is at the forefront of efforts to speed up and improve the quality of genomic analysis, is among those computational whizzes helping to bail researchers out. He is particularly interested in comparative genomics, whether that is comparing genomic changes across species or changes between one cancer genome and another. Ma’s team designs software tools to quickly and accurately identify those differences.

Ma, who earned his bachelor’s and master’s degrees in computer science at Fudan University in Shanghai, was always interested in computers, but he first realized the potential of computer science to contribute to biology when the draft

human genome sequence was published in 2001.

“At first I was interested in designing faster, more efficient algorithms, but later I figured out biologists can use this work,” he says. “Now, it must make biological sense, otherwise it’s not interesting to me.”

Ma came to the U.S. in 2003. He earned his Ph.D. in 2006 from Penn State University and was a postdoctoral fellow at UC Santa Cruz for two years before coming to the University of Illinois.

His team relies on the interconnectedness of genes when building their software tools. All genes in a cell are interconnected, so if one gene is perturbed what is the impact of that perturbation elsewhere? Ma maps those perturbations, including point mutations, rearrangements, or duplications in genes as well as chromosomal changes to study their impact, with the help of pathways and gene networks. Integrating all this data is a highly complex process.

Ma has focused his energy on problems that either have not received much attention, including structural genomic alteration in evolution, or are just emerging, including the problems associated with cancer genomics.

His comparative approach is useful for understanding evolution. Chromosomes accumulate alterations over time, just as genes do. So, for example, the human chromosome 2 corresponds in chimps (as well as in other primate species) to two separate chromosomes. That means after humans and chimps diverged the two chromosomes merged into a single one in humans.

There are many challenges inherent in an under-

taking of this scope. One is the sheer quantity and complexity of data.

“Traditionally people just look at changes in the bases, but if you look at chromosomal structure they also differ,” says Ma. “This problem has had less attention, partly because of its computational complexity.”

The methods used to compare between two and five species do not scale for a large number of species or genomes, says Ma. So his goal is to design different methods that can compare many more species or genomes in order to better answer “biologically relevant questions.”

“The software and the hardware are not ready,” he says. “Once we have that kind of framework and tools they can facilitate biological discovery. This campus has special expertise in that area thanks to our strong computational strengths.”

Understanding the genomic underpinnings of disease, specifically cancer, is equally complex. Cell-making machinery gone haywire is cancer’s trademark, after all. That makes cancer especially heterogeneous and difficult to model. Researchers are using next generation sequencing technology to look at genomic alterations in cancer cells. Ma hopes to use his computational expertise to more reliably identify these changes and also to understand their roles in gene regulation.

One aspect of this problem is how to “rank order” genetic alterations based on their roles in cancer development and progression. Which mutations are the so-called “driver” mutations and which ones are just along for the ride, or “passenger” mutations? Traditionally researchers would identify driver mutations by sampling a very large number of patients, but in cancer rare, patient-specific mutations also can be drivers due to cancer’s high degree of heterogeneity. Ma is developing a tool that he hopes will flag those rare mutations as well.

How does one develop tools to analyze almost infinite amounts of data? It comes as no surprise that it is a highly collaborative and cross-disciplinary undertaking. Researchers often seek Ma out in their efforts to understand their mountains of data. His is an iterative process: his group builds algorithm-based software tools to analyze the data, and then compares their results with the findings from experimental validations. Where his model does not fit the findings, his team makes adjustments to improve the methods. Ma collaborates with scientists at other institutions and medical centers. In addition, he is collaborating with experimentalists in IGB, including Gene Robinson, who initiated the 15K project.

Computational tools like those Ma is developing will help lay the groundwork for future genomic

» Monthly Profile cont.

advances. For example, the cost of sequencing may eventually drop to virtually free, Ma predicts. At that point, assuming computational techniques like those Ma is developing also become faster and more accurate, doctors may simply sequence a patient's sample every few years to catch an abnormality before it becomes a disease.

Many major challenges exist. For example, sequencing "knits" together bits of DNA, or

"reads." When the reads are short, it is difficult to accurately knit them together. Ma received an NSF CAREER award last year for his efforts to design new, more reliable methods for genome assembly as part of the project to study chromosomal evolution.

The award is, "very encouraging for junior people like me," he says.

A second, equally difficult challenge is how to compare genomes once they are assembled. A very recent NIH grant will enable Ma to develop tools to assess existing "multiple sequence

alignment" resources and, more importantly, to correct current multiple sequence alignments to make genome annotation (including disease-related signatures) more reliable.

"Any biological inference based on this new resource will be more accurate," he says.

Handling the data deluge is a daunting task, but Ma credits the collaborative spirit at IGB for making his aspirations achievable.

"This institute is really great. I enjoy spending time here," he says. ■

{IP @ IGB}

OTM works with IGB and campus to partner with industry

The Office of Technology Management can help make the intellectual property (IP) process with industry partnerships easier by getting a campus department involved early.

"The sooner we can get all parties who need to be involved in the partnership agreement to the table, the quicker we can get all issues on the table," said Lesley Millar, Director of Office for Technology Management (OTM).

By inviting the OTM and the Office of Sponsored Programs and Research Administration (OSPRA) early, they can participate in discussions with corporate entities who are interested in commercialization of University IP.

Millar says she encourages faculty and administrators to think of OTM and OSPRA's involvement as the relationship building part of the process.

"Identifying cultural differences in negotiation, or commercialization strategy differences or just explaining what possible areas both parties might feel strongly about is important in advance of 'starting the negotiation,'" she said.

Millar said sometimes if legal or IP parties are brought in near the end of a discussion they can be seen as a roadblock.

"That's why we encourage faculty and administrators to invite OTM and OSPRA to participate early on in discussions with corporate entities," she said.

In recent negotiations with BP and the Energy Biosciences Institute and Abbott and the Center for Nutrition, Learning, and Memory, the OTM worked with various parties including representatives from the Institute for Genomic Biology.

"(OTM) was part of the initial team finding out what Abbott was interested in, what their commercialization strategy was, and what their expectations were in regard to what the proposed

center would achieve," Millar said.

Abbott and the University established the first multidisciplinary nutrition and cognition research center that will lead directed and solicited research on the impact of nutrition on learning and memory in the human brain. The center will utilize the IGB and Beckman Institute for Advanced Science and Technology.

Helping to decide intellectual property issues early in the relationship period can help to determine how the IP will benefit all parties.

"Usually one of the most significant discussions is whether the company is going to be able to use all resulting IP and under what terms—for free, for a fee, on a royalty basis, or other payment schedule," Millar notes. "Knowing expectations at the outset helps in developing a strong relationship."

OTM helps to encourage innovation, enhance research, and facilitate economic development through the effective management, transfer, and commercialization of University inventions. Their office is located at the Urbana-Champaign campus.

Jen Rice, OTM Associate Technology Manager with a focus on life sciences, said she is working with faculty at IGB to carry out that mission.

"We are letting industry know that the University and OTM are working together," Rice said. "And,

we are showing that through these partnerships."

The OTM not only helps with contract terms related to intellectual property but the office also helps faculty and the corporate partner to make sure enough information is available to move forward with a decision. Millar says she hopes that all the stakeholders they work with will trust OTM to provide a balanced perspective.

"We have information on a range of interactions that the University has entered into over the years," she says. "We have learned a lot and hope that in that learning we can identify particular models that might work best for certain engagements."

They also help corporate partners and faculty in understanding the terms of a contract and the process to handle disclosures of new IP.

Millar said the OTM has seen an increase in these agreements in recent years.

"We enjoy these types of interactions as it also offers OTM staff a chance to get to know corporate partners outside of the typical licensor/licensee negotiation situation," she said.

To learn more about OTM and what they can offer to IGB faculty and researchers, contact Jen Rice at (217) 244-1275 or jenrice@illinois.edu. ■



{Around the IGB}

Symposium

IGB Fellows Symposium



Register now for the sixth annual IGB Fellows Symposium, on May 3, 2012.

Learn about IGB research, hear about current issues in the life sciences, and connect with other students on campus at the event. This full-day event, sponsored by the IGB, is also your chance to share your research at the popular Poster Session and reception.

In addition to hearing talks from the IGB Fellows, guest speaker Nancy Moran, William H. Fleming Professor of Biology, Yale University, will give the keynote with her talk titled "Genome Evolution in Symbiotic Bacteria".

If you have any questions please contact fellows-symposium@igb.illinois.edu. And for more details about the events and to complete the free registration, please visit <http://conferences.igb.illinois.edu/fellows/> ■

Awards

Ping Ma

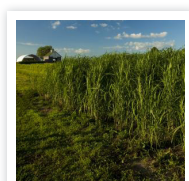


Ping Ma, Associate Professor of Statistics, IGB faculty member and affiliate of our Genomics of Neural and Behavioral Plasticity research theme, has recently won

The Canadian Journal of Statistics award. The Statistical Society of Canada presents this award each year to the author of an article published in the journal, in recognition of the quality of the paper's methodological innovation and presentation. Ma's paper, *Nonparametric Regression with Cross-Classified Responses*, was selected, and he has been invited to present at the 2012 Annual Meeting of the Statistical Society of Canada in Guelph, Ontario. ■

Conference

EBI Biofuels Law and Regulation Conference



The Fourth Annual EBI Biofuels Law and Regulation Conference, "Focusing in on the Renewable Fuel Standard (RFS2)," will be held at the I-Hotel in Champaign, Illinois on

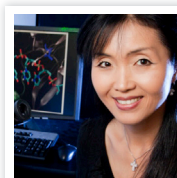
April 25, 2012, sponsored by the EBI Biofuels Law and Regulation Project.

The conference will focus on the multitude of issues surrounding the implementation of the federal Renewable Fuel Standard (RFS2), with unique sessions discussing current economic evaluations of the RFS2, industry perspectives on the RFS2, and feedstock availability and agricultural impacts of the RFS2.

The conference will involve leading academic, scientific, government, and industry experts, with opportunities for in-depth discussion between and among speakers and audience members. The organizers have structured the program to appeal to business, law, government, academia, biomass producers, students, and the public generally.

Detailed information can be found on the Conference website, www.biofuellawconference.org. Cost of attendance is free, but registration is required. Registration questions should be directed to Elizabeth Stull, Conference Administrator, at estull@illinois.edu ■

Sua Myong



Sua Myong, Assistant Professor of Bioengineering and IGB faculty member of our Cellular Decision Making in Cancer research theme, has been awarded a Human

Frontier Science Program research grant. These grants are provided for collaborative teams of scientists from different countries and disciplines, to combine their expertise in innovative approaches to life science questions unable to be answered by individual laboratories. The grant, "RNA Helicases in RNA/Protein Body Assembly and Function: A Multi-scale Approach," will support studies of sub-cellular compartments consisting of assemblies of RNA and proteins, and how their biological functions are carried out. Her team also includes Dr. Cliff Brangwynne (Princeton), and Dr. Christian Eckmann (MPI Dresden, Germany). ■

Genomics

Archon Genomics X PRIZE

Beginning in January 2013, teams will compete to accurately sequence the genomes of 100 healthy centenarians within 30 days for less than \$1,000 per genome. A \$10 million prize will be either awarded to a single winner or divided among successful teams in the Archon Genomics X PRIZE presented by Medco.

Victor Jongeneel, senior research scientist at both IGB and the National Center for Supercomputing Applications (NCSA), was among the experts who defined the validation protocol for the competition.

To learn more, or to nominate a centenarian, visit <http://genomics.xprize.org/medco-100-over-100>.

The IGB will also be hosting an event to discuss

our involvement with the X Prize, NCSA, and our knowledge of genomics. **Partnering with the Genomics X-Prize: Genomics and Large-Scale Computing** takes place on May 3, 2012 at 4:00pm, in room 612 IGB. ■

Social Committee

IGB Game Night

Friday, April 20
4:00pm to 6:00pm
IGB Concourse Level

The IGB Social Committee is sponsoring another IGB Game Night. Families are welcome! Enjoy traditional board games or try your hand at some multiplayer Wii fun. ■

UIUC-Illinois iGEM



The UIUC-Illinois International Genetically Engineered Machine (iGEM) team has won a bronze medal at the 2011 iGEM regional jamboree competition. iGEM is the

premiere undergraduate competition in synthetic biology, where student teams utilize biological parts in order to build biological systems and operate them in living cells. Their goal was to create a bacterial filing system, E. chiver. ■

ADMINISTRATIVE NEWS

{Biotechnology Information Center }

Medical Information Resources



UNIVERSITY LIBRARY
UNIVERSITY OF ILLINOIS AT URBANA-CHAMPAIGN
Library Catalog

If you've ever suffered information overload when you've Googled for medical information, or wondered if the facts

you found were really from an authoritative source, try one of these online medical resources—available to all U of Illinois students, faculty, and staff. Find links to these resources in the Library Catalog, <http://vufind.carli.illinois.edu/vf-uiu/>, and Online Journals & Databases, <http://openurl.library.uiuc.edu/sfxlcl3/az?>

MD Consult, from Elsevier

http://vufind.carli.illinois.edu/vf-uiu/Record/uiu_6688149

Brings important medical resources together into an integrated online service to help physicians find answers to pressing clinical questions. Provides access to leading medical reference books, journals and the Clinics of North America. Additionally MD Consult has over 10,000 patient handouts, Gold Standard drug information, practice guidelines for nearly 50 medical specialties, and over 50,000 medical images. Register to receive weekly updates.

UpToDate Online, from Wolters Kluwer Health

http://vufind.carli.illinois.edu/vf-uiu/Record/uiu_5589994

Deemed a “must have” resource by clinicians, UpToDate Online is an evidence-based knowledge system authored by physicians to help clinicians make the right decisions at the point of care. All UpToDate Online content is written and edited by a global community of physicians who are experts in their specialties; the content is continually reviewed to ensure it is based on the latest evidence. Only available from on-campus.

Access Medicine, from McGraw-Hill

http://vufind.carli.illinois.edu/vf-uiu/Record/uiu_6711342

Provides access to more than 65 medical textbooks containing thousands of images and illustrations, tutorials, drug information, a diagnostic tool, patient information flyers, and more. Textbooks include such classics as Harrison's Principles of Internal Medicine, CURRENT Medical Diagnosis & Treatment 2012, Basic & Clinical Pharmacology, 12 ed., and more. Completely searchable.

The Cochrane Library, from John Wiley & the Cochrane Collaboration

http://vufind.carli.illinois.edu/vf-uiu/Record/uiu_6831495

The Cochrane Library is a collection of six databases that contain high-quality, independent evidence to inform healthcare decision-making, including the Cochrane Database of Systematic Reviews—the leading resource for systematic reviews in health care.

Oxford Textbook of Medicine, from Oxford University Press

http://vufind.carli.illinois.edu/vf-uiu/Record/uiu_6811569

Often found on shelves in physicians' offices, this massive work is unrivalled in its coverage of the scientific aspects and clinical practice of internal medicine and its subspecialties. Campus use is limited to one user at a time.

MedlinePlus

<http://www.nlm.nih.gov/medlineplus/>

You've all used PubMed [aka Medline], but this resource from the NIH is geared at providing consumers with free, quality links to information. Use MedlinePlus to learn about the latest treatments, look up information on a drug or supplement, find out the meanings of words, or view medical videos or illustrations. You can also get links to the latest medical research on your topic or find out about clinical trials on a disease or condition.

Health Information Portal

<http://www.library.illinois.edu/health/>

This locally created website will point you toward the best databases, books, journals, and web resources on over 30 health related topics, ranging from aging and neuroscience to genetics, public health, psychology, toxicology, and more. ■

{Safety}

Safety at IGB

The following is included in this IGB Newsletter to stress the importance of safety at the IGB. The IGB Administration is here to assist any of our researchers to prevent something like this from ever happening at the IGB. If you have any questions or concerns please contact: safety@igb.uiuc.edu

On December 2008 a very unfortunate accident occurred, at UCLA, where a researcher was burned in a chemical accident and subsequently died of her injuries. Full details of this incident can be found at <http://goo.gl/mvfa7>, as well as the L.A. Times article here <http://goo.gl/J5hc3>. ■

{Communications}

IGB Videos on YouTube



Did you know that there is a dedicated channel on YouTube for all the great videos we produce?

View them all, including our newest addition, a short interview with IGB Fellow Jim Davis, at <http://www.youtube.com/user/IGBillinois>.

If you have a great idea for a video or would like to have yourself, your work, or the work of your lab featured, please contact Nicholas Vasi at nvasi@illinois.edu ■

Travel Expense Management (TEM)



The University will be rolling out the Travel Expense Management (TEM) system. It is a web-based system for submitting, approving and tracking requests for Travel and Miscellaneous Reimbursements & Non-Purchase Order Payments to Vendor.

Please be aware that the TEM system replaces the current Excel spreadsheets used for processing employee reimbursements, employee advances, and miscellaneous voucher payments such as honoraria, prizes and awards, non-employee reimbursements, etc.

PAPER COPIES WILL NO LONGER BE ACCEPTED.

You are strongly encouraged to attend an Intro to TEM Session (Webinar) to see the system functionality, learn about supporting resources, and ask questions you may have. You may register for one of the Intro to TEM Sessions by going to <http://training.obfs.uillinois.edu/index.cfm?campus=o> and selecting an Intro to TEM Session (Webinar).

In addition to the Intro to TEM Session (Webinar) there is the “TEM Resource Page” located at <http://www.obfs.uillinois.edu/tem-resources>. The “TEM Resource Page” is designed to provide you with the resources you need to successfully complete the tasks within the TEM system.

If you have questions about the new TEM system, please contact Dale Johnston, 217-244-5595 or at dkjohnst@uillinois.edu. You can also send an email to TEMhelp@uillinois.edu ■



I L L I N O I S

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