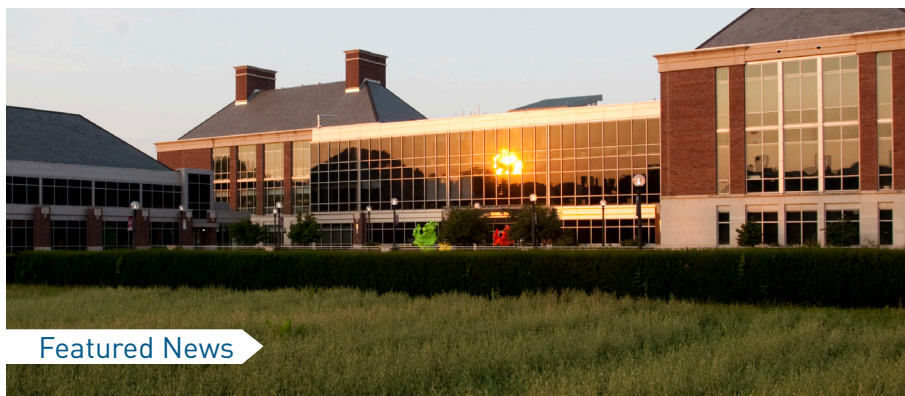




IGBNEWS

Achievements, awards, and information about the IGB community

Volume 6, Number 1



Featured News

- p. 2 Remembering Carl Woese
- p. 5 First BGI-IGB Workshop Takes Place in Shenzhen, China
- p. 6 Become an IGB Fellow, New Arrivals
- p. 7 Administrative News

Upcoming Events

Inaugural Harris A. Lewin Pioneer in Genomic Biology Distinguished Lecture

February 19, 2013

12:00 p.m.

612 Institute for Genomic Biology

Evan Eichler, PhD

*Professor, Department of Genomic Sciences,
University of Washington*

**“Structural Variation, Disease and the Evolution
of the Human Genome”**

Reception immediately following lecture.

Bake-off and Culinary Competition

February 25, 2013

4:00—5:30 p.m.

IGB Concourse Level

Join the IGB for a bake-off and culinary competition. All individuals or groups are invited to attend and participate.

When possible, please email mmckilli@illinois.edu with the name of your sweet and/or savory dish.

Pioneers in Genomic Biology Lecture Series

February 26, 2013

12:00 p.m.

612 Institute for Genomic Biology

Wolf B. Frommer, PhD

*Professor, Department of Biology, Stanford School of
Medicine*

**“A Multi-Pronged Approach to Plant Nutrition:
Pico-Sensors for Transport Gene Discovery and
Regulation”**

Art of Science 3.0 Opening Reception

April 18, 2013

6:00—8:30 p.m.

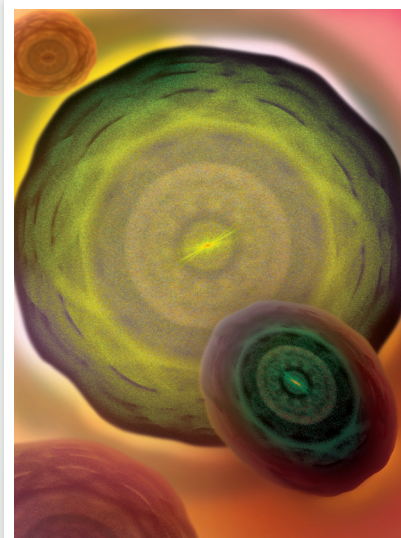
Indi Go Gallery

9 E. University Ave.

Champaign, IL 61820

Save the date for an event that successfully spans two divides; art and science, and town and gown.

Image of the Month



This month's image, “Fast Fourier Transformation of a Superresolution Structured Illumination Image of a Cell”, is courtesy of Mayandi Sivaguru of the IGB Microscopy Core Facility.

This image was taken using the Zeiss Elyra S1: SR-SIM System.

IGB News

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

Remembering Carl Woese



Professor of microbiology and a founding member of the University's Institute for Genomic Biology, Carl Woese was a giant among scientists. Best known for his discovery of Archaea, a third domain of life, his wider work and theories have transformed scientific thinking about the very origins of life and the nature of evolution.

Professor Woese passed away in December of 2012 at the age of 84.

"Carl was truly a man of vision, creativity and passion, with a deep love of this university," said Gene Robinson, director of the IGB. "Carl demonstrated that DNA provides the common threads that unite all forms of life on this planet and also began to show how they are related to each other. He rewrote the textbook on evolutionary biology. In addition, without Carl's discoveries, we would not have the tools today to study the human microbiome, the incredibly diverse and complex assemblages of microorganisms in our bodies that contribute so much to both health and disease, in ways that we're only beginning to understand. Carl Woese was one of the most significant biologists of the 20th century."

In the mid-1950s the discovery of the structure of DNA triggered extensive research into deciphering the genetic code, which has yielded much insight. But Woese, whose research career spanned more than 60 years, believed the more fundamental question was, how did the code get here in the first place?

Perhaps understanding the origin of the translation mechanism of the genetic code could lead to an understanding of how the cell evolved, which could lead to understanding the very origins of life itself. Woese's curiosity about this problem animated his entire career.

"In the popular imagination Darwin figured it all out in his *On the Origin of Species*," says Nigel Goldenfeld, professor of physics and longtime collaborator. "Well, what was evolution like before there were species? What was evolution like before there were genes? Carl Woese was already thinking of these questions in the 1970s."

For Woese the origin of species, Darwin's claim to fame, was an epiphenomenon of the evolutionary process; the more important question was how cells first emerged and how they became organized into organisms.

"Woese did more for biology than Darwin," says Norman Pace, professor of molecular, cellular and developmental biology at the University of Colorado, Boulder. "What Woese did was wholly original. Darwin did not have the originality of Woese."

Woese thought the first step to understanding the origins of life would be to find a way to determine a phylogenetic tree for all of life. Since at that time biologists divided the living world into eukaryotes (can be multi-celled, and have a nucleus) and prokaryotes (single-celled organisms with no nucleus) he thought he might be able to find the organism that existed before the two branches split.

In order to pursue this very speculative, risky research, Woese, a brilliant, iconoclastic thinker, needed institutional support. The University of Illinois provided it. When Woese was hired, in 1964, the head of his department simply offered him a tenured position at the same salary he had in his previous job at GE.

It was the beginning of a beautiful relationship.

It is no accident that Woese's work took place at the University of Illinois, says Goldenfeld. "People here have the time to be a bit more contemplative. When you are on one of the coasts, in the thick of things, there is more social pressure to get on with things."

But how to actually conduct this research? One challenge was how to classify microbes, considering that, unlike toucans and tigers, they can't be compared using morphological differences. Another challenge was what part of the cell would provide the best "fossil" record?

Woese managed to solve both of these challenges with highly creative scientific thinking. He determined that if there's going to be one place to look, it should be part of the machinery essential to making proteins. The ribosome, he reasoned, forms part of the protein-making machinery at the heart of all cells and every organism has them. Changes that occur in the ribosome can't be so frequent that they are hard to follow and they can't be so rare as to be uninformative.

In order to choose the ribosome Woese had to have a deep understanding of its biochemistry, which he did. Many of Woese's earliest papers concern the biochemistry of the ribosome.

"He chose the 'Goldilocks' spot," says Goldenfeld. "Nobody since then has come up with a better idea for a molecule to look at as the proxy for the history of evolution. There are other molecules one could use, but this is the best one because it varies so slowly. He really thought it through. If it was going to be anything it was going to be the ribosome."

Serendipitously, Frederick Sanger had just developed an early sequencing technique known as oligonucleotide cataloguing. Woese thought he'd try to adapt it and use it to create his phylogeny. And so, in the late 1960s he began to classify life by sequencing the 16S rRNA (ribosomal RNA) gene of as many organisms as he could get his hands on. It took him a year to create his first catalog.

"What Carl invented in a sense was a microscope that goes back in time," says Goldenfeld. "It works by reading molecular sequences in a smart way so that we can work back and see what must have been the changes that happened at a molecular level as organisms evolved."

Monthly Feature

Adapting Sanger's method to study the RNA of the ribosome (which, he reasoned, pre-dated DNA) gave Woese both a way to categorize microbes and to study the deep evolution of cells.

So while the majority of the scientific community was trying to understand how the code worked, Woese spent more than a decade working in obscurity to figure out where the code came from in the first place.

In those early days sequencing was mind-numbing, repetitive, solitary, and tedious work. By 1976 he had sequenced the 16S rRNA of about 30 different kinds of bacteria. Today, with computers and automated sequencers, the work that took him thousands of hours would take less than a week. It took 10 years of this work before he began to publish his findings.

But Woese never gave up.

"He knew what he was asking and why," says Goldenfeld. "It's that kind of very open-minded scientific investigation, it's very rare that people would do that. You have to really convince yourself that this is the right thing to do and be very determined."

Woese's method worked perfectly; it showed a clear difference in the 16S rRNA between eukaryotes and prokaryotes. One of the most revolutionary results of this work is that, for the first time ever, microbes could be objectively catalogued. Bacteriologists had long since given up being able to do anything of the sort. This achievement opened up the world of microbes to further study and analysis.

Meanwhile his work led Woese to an unexpected discovery the day he analyzed a methanogen. Methanogens, it was thought, are prokaryotes that live in very hot, oxygen-free environments and produce methane gas. They are difficult to grow in the lab, but Woese's colleague Ralph Wolfe had succeeded and offered his methanogen to Woese for his project.

"The big surprise was when we finally did do one of these methanogens . . . uh-oh, it didn't fit into the prokaryote signature," Woese once said.

The methanogen didn't fit with the eukaryotic signature, either. In fact, methanogens share some characteristics with both eukaryotes and prokaryotes, Woese determined that these organisms, which he termed Archaea, are a third form of life that arose separately from prokaryotes and eukaryotes.

Woese did not set out to discover the Archaea. They were as much a surprise to him as to the rest of the scientific community. The finding, announced in 1977 in the journal *Proceedings of the National Academy of Sciences* and trumpeted in newspapers and magazines around the world,

rocked the scientific community. This was no new species of butterfly or frog, but a whole new branch of life. Granted, it had been hiding in plain sight; researchers had thought Archaea were bacteria because they looked like bacteria. Thanks to Woese we learned they were not.

This discovery absolutely transformed taxonomy, phylogeny and evolution into experimental sciences rather than subjective pursuits. Woese's work also unveiled the great diversity in microbes. We know now that on the tree of life plants and animals are the tiniest twigs, and microbes occupy 90 percent of the branches. Today, researchers investigate everything from the role of microbial communities in the human gut to microbes in the environment. Their work would not be possible without Woese's fundamental research.

"He was very clever, he understood so much and yet so much was intuitive for him," says Goldenfeld. "There are other, highly technical things that he did that were just brilliant. Some of them I would ask him, 'why did you do this? And how did you have this stroke of insight?' and he'd say, 'I don't know, actually.'"

Woese's groundbreaking approach and paradigm-shifting research findings should have made the University of Illinois the center of this new field of research. But there was strong resistance within the scientific community. He was not invited to speak at conferences; graduate students did not flock to his lab; funding was sparse.

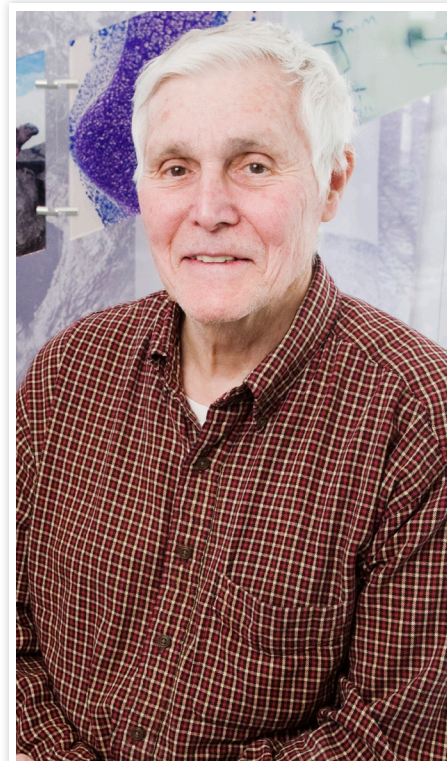
There were many hard years, but gradually the magnitude of this discovery began to be recognized.

Woese received a MacArthur Fellowship (1984); election to the National Academy of Sciences (1988); the Dutch Royal Academy of Science's Leeuwenhoek Medal, the highest honor in microbiology (1992); and the U.S. National Medal of Science (2000). Probably the most important recognition for Woese was the \$500,000 Crafoord Prize in Biosciences in 2003 in recognition of his discovery of the Archaea. The Crafoord Prize is the equivalent of the Nobel Prize for his field, for which there is no such prize. He was elected to the Royal Society in 2006.

When asked about this major contribution, Woese shrugged it off.

"I'm just an average guy," he told one magazine. "I just happen to have a pretty good intuition regarding biology. I may have brought the complete phylogenetic tree into being, but all I am is a midwife. I'm just glad I was there to help bring it in. Do I feel proud about it? Yes, sometimes. But I don't sit around thinking how great I am.

"I come in here every day because I love this stuff, that's all. To be able to study the past, and to look



back down the road into what was happening three or four billion years ago—what a privilege!"

Meanwhile, Woese did not rest on his laurels.

Having studied untold numbers of microbes, he began to appreciate that they swap genes constantly between organisms, not just between a single species. This so-called "horizontal gene transfer," or HGT, is an entirely different model than vertical gene transfer, which occurs when genes are passed from parents or ancestors. Woese posited a connection between the origin of the genetic code, the translation mechanism and the emergence of cells and their organization.

2003 not only marked his receipt of the Crafoord Prize, but also the launching of the IGB at the University. Woese's involvement with, first the W. M. Keck Center for Comparative and Functional Genomics, and then the IGB was critical for both Woese and the University. In the late 1990s, Woese was instrumental in getting a major grant to create the Keck Center. There were already four or five major NIH-funded centers for genomic research in the country focused on sequencing the human genome, but that suggested to Harris Lewin, then head of the University's Carver Biotechnology Center, later founding director of the IGB, and now vice chancellor for research at University of California, Davis, that Illinois could conduct genomics research on a great many biologically interesting organisms, not just humans or the traditional animal models, such as

Monthly Feature

mice and flies. Analyzing the genomes of organisms based on their location in the tree of life fit with Woese's continued interest in evolutionary questions. Woese was extremely supportive of the "phylogenomics" concept and made a convincing presentation to the Keck Foundation representatives at the site visit prior to the \$1.25 million award being made.

At roughly the same time discussions began on campus about an inter-disciplinary institute (which eventually became the IGB) that could probe questions of biology using genomics as the enabling technology. Lewin spent many hours discussing these ideas with Woese, who was excited about the prospect and threw his weight behind the initiative. In addition, discussions with people like Goldenfeld, who could translate his concepts into mathematical models, were very exciting to him.

"Carl had been searching for the answers to big questions in evolution. That's what drove him, and the IGB represented new thinking on the topic," says Lewin.

Ultimately, the IGB, specifically the biocomplexity theme, became Woese's new intellectual home, says Lewin.

And meanwhile, Woese's insights and conversations helped Lewin develop his own thinking.

"He became a mentor to me," says Lewin. "I changed my thinking and even my research direction based on our discussions."

Woese's influence will be felt for many years to come. His work of the last 40 years played a pivotal role in a recent project proposal to mine genomic data to determine universal aspects of the evolution of life and will characterize the fundamental principles governing the origin and evolution of life elsewhere in the universe. NASA's Astrobiology Institute recently funded this project with a five-year, \$8-million grant to IGB's Biocomplexity research theme.

In a 2006 paper, Woese theorized that Darwinian natural selection (and vertical gene transfer) did not become a factor in evolution until more complex life forms evolved. He suggested that in the early stages of the development of life, all organisms engaged in HGT and were not in competition. It is possible, Woese thought, that HGT was the norm for billions of years; far longer than natural selection and vertical gene transfer. Woese also proposed that instead of all life evolving from a single cell or pre-cell, that various forms of life evolved independently from as many as several dozen ancestral pre-cells. The three forms of life, archaea, bacteria and eukaryotes may have emerged independently from this soup of pre-cells.

Woese is regularly hailed as an intellectual genius, slaving virtually alone for years upon years, wearing his trademark red-plaid flannel shirts and worn out sneakers, doggedly pursuing his research. But what is missing from this narrative is the enormous influence Woese had as a teacher and mentor.

Over and over again his former students talk about Woese being an outstanding teacher because he was learning and questioning things all the time. Larry Gold, who first met Woese when they were both working at General Electric, says one of his most common expressions was "Huh, I didn't know that."

"He taught me how to think," says Gold, now a professor at the University of Colorado, Boulder. "That's his gift. He never ever cared that I was just a kid. He talked to me, to all of us, the same way.

"I'm always carrying that guy on my shoulder," he says. "People like Carl don't come around too often. It's kind of magical."

Woese modeled, for students and colleagues, how to think about things, to step back and wonder about the big picture. Woese's behavior reminded others that they can also always be learning, says Gold.

"I wouldn't call Woese a teacher," says Pace. "I'd call him a guru. He showed the way."

"Carl knew how to think about things," says Dan Wolf, (PhD '76), CEO of Videobotics, a technology development company.

As a graduate student in zoology, Wolf took a class in molecular genetics taught by Woese as an elective. "This class was more than the facts, it was how to think about things," he says. "I'd never come across anything like this. Up until now my classes had been cut and dried: chemistry, physics, math, etc., all discrete and focused. Carl talked about the philosophy of how living systems work and the problems with how we think about them. We talked about what is not known."

From that time on, Wolf "got permanently stuck in the Carl Woese field of gravitational attraction. And I never left. I moved away, but every time I returned to town, I always came by to visit Carl."

Dan Oerther, who earned his PhD from Illinois in 2002, also took a graduate-level class with Woese when he was at Illinois. He got so much out of it he participated three more times.

"Carl's course was something unique," he said.

"You would attend a 90-minute lecture, twice per week, for fifteen weeks. Each lecture was interesting, and most of the time Carl would talk about whatever was on his mind — his scientific thought of the day, as it were."

Chatting with and listening to the ideas of such a tremendous teacher twice a week was a highlight of Oerther's time at Illinois, he says. Another of Oerther's favorite memories was the class period when students brought a cake to celebrate Woese's teaching. Oerther, now a professor of environmental engineering at the Missouri University of Science and Technology, still remembers Woese's smile, covered in blue icing.

"It was incredible to have so much fun with someone of such scientific stature," said Oerther. "The ability to interact with him was amazing!"

Woese was a deep, deep thinker and intensely private, yet enormously generous with his students and his friends, and stoutly loyal. He really enjoyed interacting with students and would talk with them about science at every opportunity. He was also quite shy, with a mischievous sense of humor; it wasn't all work and no play with Woese.

For five years in the 1980s, for example, microbiology students in Woese's and Wolfe's labs organized an annual putt-putt golf tournament, the Archaea Masters ("putt-putt belongs to the archaea"). There was a desire for a famous sponsor



»» The Archaea Masters green jacket, presented to the annual tournament winner.

and Woese, the "Archaeaköening," was the clear choice. Following the tournament each year the group retired to Woese's house, aka the Phylogenanda Ashram, for a cookout. Jorge Escalante, now a professor at the University of Georgia, remembers those cookouts fondly.

"As students, we saw the side of Carl that few others saw," he says, of that time. "A real friend, unassuming and genuine." ■

First BGI-IGB Workshop Takes Place in Shenzhen, China

As part of an international exchange of knowledge and ideas, the Institute for Genomic Biology and BGI (formerly known as the Beijing Genomics Institute) are engaging in a series of learning and discussion workshops. The first workshop was held in Shenzhen, China, from January 21st to January 25th, 2013.

Seventeen members of the IGB traveled to BGI for the week-long workshop, arriving in Hong Kong and journeying via bus across the border to China to their destination of the Yantian District of Shenzhen.

Founded in Beijing with a mission to support the development of science and technology, build strong research teams, and promote the development of scientific partnership in genomics, BGI's headquarters were later relocated to Shenzhen as the first citizen-managed, non-profit research institution in China. BGI engages in large-scale, high-accuracy projects, such as sequencing 1% of the human genome for the International Human Genome Project.

The first day of the workshop began with IGB members meeting with BGI leadership to understand their vision concerning sequencing technologies, and the impact of their pending acquisition of Complete Genomics, a company dedicated to large-scale whole human genome sequencing and bioinformatics analysis. They received a tour of the facilities including the Illumina HiSeq 2000 sequencing system, which along with the other sequencers onsite are capable of producing 6 terabytes of data per day.

Lectures that day from BGI members included the application of genomics in biodiversity analysis from Dr. Guojie Zhang, followed by a talk from Dr. Jing Zhao on the progress and application of sequencing technology, and the capabilities of current next-gen sequencing technologies. The day ended with a discussion from Dr. Ruibang Luo on algorithms for alignment and assembly, and the comparison of different assemblers and second-generation assemblers. The IGB members were avid participants in these discussions, raising many relevant points on algorithm use and strategies for the building of gene models and gene annotations.

The second day featured lectures on technologies and methods in metabolomics by Dr. Hemi Luan, and plant genomics by Xin Liu, which focused mostly on BGI strategies for denovo assembly of plant genomes. These lectures and others were well-matched to the interests and background of the IGB members attending and provided high quality, productive discussions and questions



» Seventeen IGB members traveled to Shenzhen, China for a week-long workshop at BGI, China's first citizen-managed, non-profit research institution.

between the two groups.

Day three of the workshop began with a lecture from the director of the China National Genebank-Shenzhen, Dr. Yong Zhang. He discussed how they have created a national biological resource bank to promote biodiversity preservation and genomic research, which is partnered with the Smithsonian museum. Dr. Zhang explained the vision of the China National Genebank-Shenzhen, to become a global biorepository for all types of human, plant, animal and microbial samples.

The afternoon lecture on metagenomics by Dr. Wanting Chen focused on current BGI projects, their role in the sequencing of the human gut microbiome and the methods used for 16s rRNA and metagenomic sample preparation and bioinformatic analysis. This was followed by a visit to the library construction facilities. BGI houses completely separate rooms for sample QC, DNA shearing, blunt-ending/A overhang/adaptor ligation, gel size selection (individual agarose gels for each library), PCR, PCR cleanup and for library QC. Another facility performs RNA extractions, with separate rooms for preparation of RNAseq libraries and exome capture.

The final lecture of the day, from Dr. Xin Zhou, was entitled "From molecules to ecosystems, answering macrobiology questions using DNA and genomics." Dr. Zhou explained the development of DNA barcoding in insects using mtDNA for population studies, and the i5K project involving sequencing the genomes of 5,000 insects. His project, involving sequencing and assembling the transcriptomes of 1,000 insects, is known as 1KITE. The project is nearly complete and will be initially used for phylogenetic studies.

The final day of lectures included disease analysis using GWAS by Dr. Qibin Li, the topic of cancer genomics by Dr. Guangwu Guo, and single cell analysis by Dr. Hou Yong, followed by some hiking in the hills surrounding the BGI building. The following day consisted of tours of the Da Fen oil painting village, which houses several hundred shops, and the Splendid China Folk Village, a large park featuring miniature replicas of several Chinese provinces, and displays of the architectural styles, cultures, and habits of different Chinese dynasties. The group also had lunch with the president of BGI, Dr. Huanming Yang, who gave his insight into the BGI philosophy and future plans for expansion.

After a 2-hour trip through customs at the border of Hong Kong due to a spring festival taking place, the group boarded their flight the next day for the 13 hour trip back to the states. The members of the workshop expressed their extreme gratitude over the opportunity to visit BGI, and for the efforts that were made to adapt the lectures and schedule to the diverse backgrounds of the attendees. The speakers in the workshop were very impressive in their knowledge and scope of contributions to the scientific community.

BGI aims to develop research collaboration and provide scientific support to scientists all over the world, and to contribute to the advancement of innovative biological and genomic research. The IGB shares these goals and gratefully acknowledges BGI for joining us in this series of workshops. In May of this year, the IGB will welcome a delegation of students from BGI to spend the week at IGB on the Illinois campus, to engage in their own interactions with students and faculty here. ■

Around the IGB

Congratulations

Isaac Cann



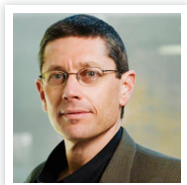
The Energy Biosciences Institute announced that Isaac Cann, Professor of Microbiology and Animal Sciences and affiliate of the IGB Biocomplexity theme, has been chosen by the EBI Governance Board to be the next **Deputy Director** of the institute. He has been involved with the EBI for many years, serving as a principal investigator within the biomass depolymerization research initiative. ■

Victor Jongeneel



Victor Jongeneel, director of High-Performance Biological Computing (HPCBio), has been appointed to the **PubMed Central Advisory Committee** of the National Institutes of Health (NIH). The committee advises the NIH on the content and operation of the PubMed Central repository, and also establishes criteria to certify groups submitting materials to the system, monitors the operation of the system, and ensures that PubMed Central evolves and remains responsive to the needs of researchers, publishers, librarians and the general public. ■

Gene Robinson



IGB Director Gene Robinson has been elected to the **National Advisory Mental Health Council (NAMHC)** of the National Institute of Mental Health (NIMH).

The NAMHC advises the Secretary of Health and Human Services; the Director, National Institutes of Health; and the Director, National Institute of Mental Health, on all policies and activities relating to the conduct and support of mental health research, research training, and other programs of the Institute.

Dr. Robinson was also recently elected by the Animal Behavior Society as the **2013 Distinguished Animal Behaviorist**. One of the Society's most important marks of recognition, this award is granted for outstanding lifetime achievement in research. ■

Giving

Walk of Life



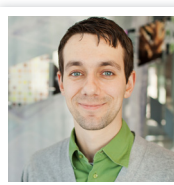
Contributing to the Walk of Life is a unique opportunity to simultaneously support our mission and become a permanent part of IGB history. Commemorate a special event, like graduation.

Deadline to have a paver installed for Spring 2013 graduation is Friday, March 8, 2013.

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

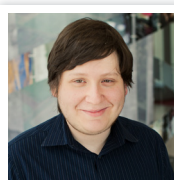
New Arrivals

Bryan Fijalkovich



Bryan Fijalkovich joined the IGB as an Office Support Associate. He provides assistance to the administration and development offices, including travel expense management, files and records, and outreach activities. Previously, Bryan was an Office Support Associate at Facilities and Services. ■

Boris Sadkhin



Boris Sadkhin joined the IGB as a Research Programmer in the Computer and Network Resource Group. He will be providing informatics support for the researchers at IGB. He is a recent graduate from the Graduate School of Library and Information Science. ■

CEM

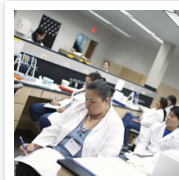
New Website Design

The Certificate in Entrepreneurship and Management (CEM) is a program for entrepreneurially minded students and postdoctoral associates interested in understanding the issues in scientific and high technical start-up ventures.

The CEM website has been revised to make finding registration and curriculum info even easier. The link remains the same, visit CEM at <http://www.igb.illinois.edu/cem/>. ■

Workshop

Summer Internship for Native Americans in Genomics (SING)



The SING Workshop is a one-week workshop aimed at discussing the uses, misuses and limitations of genomics as a tool for Native American communities. The workshop will also assist in training Native Americans in the concepts and methods currently used in genomics.

Registration is now open, anyone interested can complete the application form on the SING site at <http://conferences.igb.illinois.edu/sing/>. ■

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>. ■

IP @ IGB

KeraFAST, A New Resource For Illinois Faculty And Researchers

The University has entered into an agreement with KeraFAST, a new resource available to Illinois faculty and researchers. The Investigator's Annexe™ program, a part of KeraFAST, partners with universities and other life science research institutions to make investigators' rare and unique laboratory-derived materials available to the research community through an e-commerce catalog. Acting as an online marketplace for research, KeraFAST will actively market and promote your products to interested scientists around the world, and when your materials are purchased, the profits are split between KeraFAST, you, and the University. For more information, contact the OTM or visit kerafast.com. ■

ADMINISTRATIVE NEWS

University Library

Savvy Researcher Workshops

The University Library has released the Savvy Researcher Workshop schedule for Spring 2013 (<http://illinois.edu/calendar/list/4068>). These free workshops are usually 50 minutes and cover a variety of tools and topics to help improve your research and information management skills.

Below are some of the sessions that might be of particular interest to researchers at IGB, but be sure to look at the online schedule for a complete list of sessions, with details and registration links.

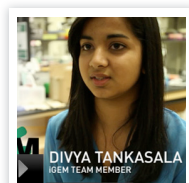
- Your research rights: Ownership awareness to maximize the impact
- Intro to data management
- Survey of resources for biomedical sciences
- Getting organized with Mendeley
- Zotero
- How to build a great poster

New this year: You can request for a Savvy Researcher session to be taught at an upcoming meeting, such as a research group, laboratory or faculty meeting. Please note that not all sessions may be available for request and special sessions must include at least five participants. If interested, you can complete a request form - <https://illinois.edu/fb/sec/6094473>

If you have questions about the library, feel free to contact Sarah Williams, Life Sciences Data Services Librarian, at scwillms@illinois.edu. ■

Communications

New IGB Videos



Have you seen our latest video, where team members and advisors from the UIUC-Illinois International Genetically Engineered Machine (iGEM) team speak about their experiences working and competing as part of the group? Or our recap of Genome Day, where we engaged the community in learning about genomes, genes, DNA, and evolution at the Orpheum

Children's Science Museum? See them all on our YouTube channel at

<http://www.youtube.com/user/IGBillinois> ■

Operations & Facilities

Weather Safety

The pavers on the west entrance of the IGB and around the Gatehouse have a tendency to become very slippery, even more so than the sidewalks and parking lots in wet and cold conditions. Please use care when walking across the plaza.

Smoking Prohibited

Just a reminder that smoking is prohibited within 15 feet of all building entrances, including areas such as the IGB loading dock. ■

Business



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 12, 2013 Tue (9:30am-11:30am)

May 9, 2013 Thu (1:30pm-3:30pm)

May 21, 2013 Tue (9:30am-11:30am)

June 11, 2013 Tue (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. ■

Safety

Lab Closeout Requirements

Researchers who are planning to leave the university must arrange for final disposal of **all** biological, chemical and radiological materials from their laboratory.

Researchers who are planning to be absent from campus for periods of 90 days or longer must ensure that their hazardous materials are in proper long-term storage or that arrangements are made for adequate supervision of their laboratory in their absence.

There should be no remaining biological, chemical or radiological material in the laboratory, all work surfaces should be decontaminated and the laboratory should be cleaned for next occupancy. Contact the IGB Safety Coordinator (244-8346) for more information on how to dispose of biological, chemical or radiological materials.

Please note that biological, chemical and radiological materials cannot be transported to another university or off-site unless they have been transported according to Department of Transportation (DOT) regulations. The regulations require specific packaging materials, labeling, and training of the person packaging the material. An individual who violates these provisions may face civil or criminal penalties. ■

CNRG

Ember Supercomputer Available

A gift from NCSA, the IGB now has available a highly parallel shared memory supercomputer named Ember. Originally funded by the NSF, the Ember computing system will be managed by the HPCBio group and is part of the IGB biocluster, adding 1536 cores and eight terabytes of memory spread across four nodes.

Ember was installed in the server room at the IGB after its October 1st decommission by NCSA. It would cost two million to purchase today. Ember will be available to anyone on campus for a service fee, which will be placed in a fund to replace the infrastructure as it becomes dated.

Ember runs a Linux operating system, and can be used in many applications including chemistry, fluid mechanics, imaging, and genomics and transcriptomics research. Ember's very large shared memory—2 terabytes in a single system—enables it to run these applications very efficiently.

For questions or further information on the Ember system, please contact Dan Davidson at dbdavids@illinois.edu. ■

Recent Publications

Eriksen D, Zhao H. Directed evolution of a cellobiose utilization pathway for biofuel production. *AICHE - AIChE Annu Meet, Conf Proc*. 2012.

Ko Y, Ament SA, Eddy JA, et al. Cell type-specific genes show striking and distinct patterns of spatial expression in the mouse brain. *Proc Natl Acad Sci U S A*. 2013.

Hübner M, Molineaux AC, Keyte A, Schecker T, Sears KE. Development of the marsupial shoulder girdle complex: A case study in *monodelphis domestica*. *Evol Dev*. 2013;15(1):18-27.

Torres JN, Bao X, Iuga AC, et al. Farnesoid X receptor expression is decreased in colonic mucosa of patients with primary sclerosing cholangitis and colitis-associated neoplasia. *Inflamm Bowel Dis*. 2013.

Mikel MA. Genetic composition of contemporary proprietary US lettuce (*lactuca sativa* L.) cultivars. *Genet Resour Crop Evol*. 2013;60(1):89-96.

Wu XL, Heo Y, El Hajj I, Hwu WM, Chen D, Ma J. TIGER: Tiled iterative genome assembler. *BMC Bioinformatics*. 2012;13:S18.

Kim J, Larkin DM, Cai Q, et al. Reference-assisted chromosome assembly. *Proc Natl Acad Sci U S A*. 2013;110(5):1785-1790.

Nabity PD, Zavala JA, Delucia EH. Herbivore induction of jasmonic acid and chemical defences reduce photosynthesis in *nicotiana attenuata*. *J Exp Bot*. 2013;64(2):685-694.

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innate immune sensor, laboratory of genetics and physiology 2 (LGP2). *J Biol Chem*. 2013;288(2):938-946.

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Liang J, McLachlan MJ, Zhao H. Orthogonal control of endogenous gene expression in mammalian cells using synthetic ligands. *Biotechnol Bioeng*. 2013.

Lee JV, Maclin EL, Low KA, Gratton G, Fabiani M, Clayton DF. Noninvasive diffusive optical imaging of the auditory response to birdsong in the zebra finch. *J Comp Physiol A Neuroethol Sens Neural Behav Physiol*. 2013:1-12.

Guo B, Zhang Y, Yu G, Lee W-, Jin Y-, Morgenroth E. Two-stage acidic-alkaline hydrothermal pretreatment of lignocellulose for the high recovery of cellulose and hemicellulose sugars. *Appl Biochem Biotechnol*. 2013:1-19.

Tierney SM, Fischer CN, Rehan SM, Kapheim KM, Wcislo WT. Frequency of social nesting in the sweat bee *megaloptagenalis* (*halictidae*) does not vary across a rainfall gradient, despite disparity in brood production and body size. *Insectes Soc*. 2013:1-10.

Leigh SR. Brain size growth and life history in human evolution. *Evol Biol*. 2012;39(4):587-599



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Contact: Nicholas Vasi • E: nvasi@illinois.edu • P: 217.333.0873
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