

IGB NEWS

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IP @ IGB

Administrative News

Volume 7, Number 4

UPCOMING EVENTS

Pollen Power! Summer Camp

A summer day camp for middle school girls

July 7 through July 11, 2014

9:00 a.m. - 5:00 p.m.

612 Institute for Genomic Biology

Pollen Power! summer camp will provide an opportunity for girls to study plant responses to climate change in the distant past and the coming century. Small research groups of campers led by a female graduate student will use million dollar microscopes to image pollen, giving the campers first-hand experience in a research environment with female mentors. Full info at <http://pollensummer-camp.illinois.edu/>.

Pioneers in Genomic Biology Lecture Series (BSD)

Title to be announced

August 5, 2014, 12:00 p.m.

612 Institute for Genomic Biology

Sang Yup Lee, PhD

KAIST Institute

Metabolic and Biomolecular Engineering

National Research Lab

Pioneers in Genomic Biology Lecture Series (BCXT)

Title to be announced

August 19, 2014, 12:00 p.m.

612 Institute for Genomic Biology

Christa Schleper, PhD

Universität Wien

Archaea Biology & Ecogenomics Division

IGB Seminar (ReBTE)

Title to be announced

September 9, 2014, 12:00 p.m.

612 Institute for Genomic Biology

Eben Alsberg, PhD

Case Western University

Department of Biomedical Engineering

FEATURED NEWS



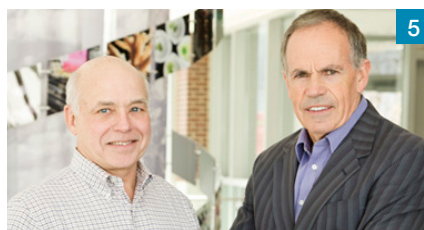
IGB Researcher Stars in
National TV Series



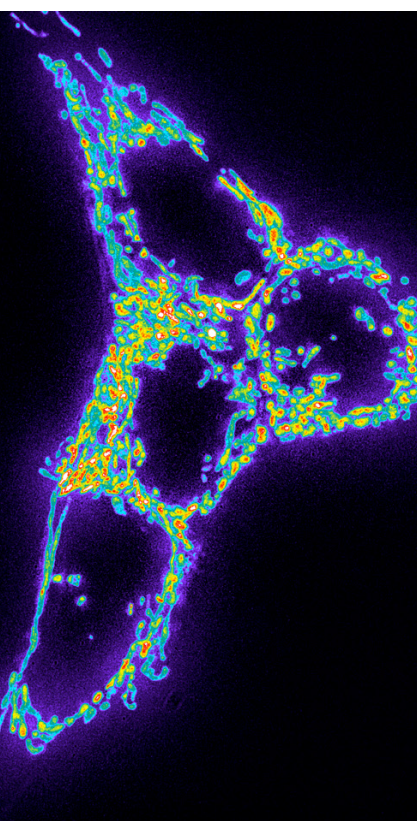
As CO₂ Levels Rise, Some
Crop Nutrients Will Fall



Profile:
Rachel Whitaker



On the Grid:
Happenings at IGB



This month's image, "Active mitochondria in a cell," shows how a genetically encoded fluorescent protein was used to detect mitochondria. Bioenergetic reprogramming occurs in many cancer cells; genetically encoded sensors have revolutionized the study of this type of phenomenon, since they offer a convenient tool to measure bioenergetic changes in live cells.

This image was captured with the Zeiss ELYRA superresolution microscope, and is provided courtesy of Vladimir Kolossov and Rex Gaskins of the Rex Gaskins Lab.

IGB News

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



IGB Researcher Stars in National TV Series

Karen Sears holds a gray short-tailed opossum in front of the camera. Special lighting has transformed this evolutionary biologist's ordinary laboratory at the University of Illinois into a television set.

Two days of filming has produced just three minutes of the 54-minute episode of *Your Inner Fish*, a three-part PBS series based on a book by the show's host Neil Shubin that traces 350 million years of human evolution.

During the second episode, which aired on April 16, Sears tells the television audience that some of the opossums' developmental processes resemble the evolution of mammals' middle ear bones from reptile jawbones (Sears appears at about the 42:00 mark in Episode 2, [watch the video here](#)). She describes how, as embryonic opossums mature into adults, two tiny bones will disconnect from their jawbone, shrink, and move up to become their middle ear bones. "So you have modern reptiles with one ear bone. You have modern mammals with three ear bones," said Sears, who is an Assistant Professor at the School of Integrative Biology and also a researcher at the Institute for Genomic Biology. "I think what the embryos do is they almost provide a link between those two. So what we see in the opossums, from the time they are born through the time they are adults, they almost go through 300 million years of evolution."

Like most research, Sears' work entails unpleasant tasks that can be difficult to discuss with a gener-

al audience. Tangled Bank Studios, the Howard Hughes Medical Institute film production company who produced the show, approached this subject with openness and sensitivity with the help of a scientific advising committee made up of leaders in the field who ensure the show's content is accurate.

"She euthanizes opossums, using dermestid beetles to clean the organisms, so she can see the bones,"

(above) Karen Sears, Assistant Professor at the School of Integrative Biology and IGB faculty member.

Shubin tells viewers as they witness the dermestid beetles eating flesh off an opossum carcass. "Karen is left with a series of skulls through which she can trace the development of the inner ear bones from embryo to adult."

By showing the dermestid beetles and discussing the arduous process of finding key fossils, the show creates a balance between discovery and the routine of lab or fieldwork.

"What we often talk about in these shows is the flashy end point, but there is a lot of work that goes into getting there," Sears said. "For people who are excited by science and really have innate curiosity about the world and about life, the work itself, even

though I've described it as repetitive, it is exciting because you know what you are doing is going to get you to that next step. Every experiment that you do could tell you something really exciting that you didn't expect to see or it could provide incremental additions to get you to that flashy end point."

For Sears, the ultimate goal is to excite the public about science.

"Who funds our research? It's the public!" Sears said. "We have a responsibility to not only show them what they are funding, but also, on the flip side, to get them interested in it. I want to get these kids excited about pursuing STEM-related careers and help their parents to understand the importance of funding scientific research, because ultimately it will be up to them to vote in favor of funding science."

Her lab may also benefit by attracting more students, increasing the number of people citing her papers, and ultimately becoming more visible in her field.

"Scientific outreach and these types of programs are incredibly valued today," Sears said. "The manifestations of being featured have the potential to be pretty large, not only for myself but for the field." ■

Written by Claire Sturgeon. Photo by Kathryn Coulter.

RESEARCH



Plant biology professor Andrew Leakey and colleagues report that levels of zinc, iron and protein drop in some key crop plants when grown at elevated CO₂ levels.

As CO₂ Levels Rise, Some Crop Nutrients Will Fall

Researchers have some bad news for future farmers and eaters: As carbon dioxide levels rise this century, some grains and legumes will become significantly less nutritious than they are today.

The new findings are reported in the journal *Nature*. Eight institutions, from Australia, Israel, Japan and the United States, contributed to the analysis.

The researchers looked at multiple varieties of wheat, rice, field peas, soybeans, maize and sorghum grown in fields with atmospheric carbon dioxide levels like those expected in the middle of this century. (Atmospheric CO₂ concentrations are currently approaching 400 parts per million, and are expected to rise to 550 ppm by 2050.)

The teams simulated high CO₂ levels in open-air fields using a system called Free Air Concentration Enrichment (FACE), which pumps out, monitors and adjusts ground-level atmospheric CO₂ to simulate future conditions. In this study, all other growing conditions (sunlight, soil, water, temperature) were the same for plants grown at high CO₂ and those used as controls.

The experiments revealed that the nutritional quality of a number of the world's most important crop plants dropped in response to elevated CO₂.

The study contributed "more than tenfold more data regarding both the zinc and iron content of the edible portions of crops grown under FACE conditions" than available from previous studies, the team wrote.

"When we take all of the FACE experiments we've got around the world, we see that an awful lot of our key crops have lower concentrations of zinc and iron in them (at high CO₂)," said University of Illinois plant biology and Institute for

Genomic Biology professor Andrew Leakey, an author on the study. "And zinc and iron deficiency is a big global health problem already for at least 2 billion people."

Zinc and iron went down significantly in wheat, rice, field peas and soybeans. Wheat and rice also

"C₄ is sort of a fuel-injected photosynthesis that maize and sorghum and millet have. Our previous work here at Illinois has shown that their photosynthesis rates are not stimulated by being at elevated CO₂. They already have high CO₂ inside their leaves."

saw notable declines in protein content at higher CO₂.

"Across a diverse set of environments in a number of countries, we see this decrease in quality," Leakey said.

Nutrients in sorghum and maize remained relatively stable at higher CO₂ levels because these crops use a type of photosynthesis, called C₄, which already concentrates carbon dioxide in their leaves, Leakey said.

"C₄ is sort of a fuel-injected photosynthesis that maize and sorghum and millet have," he said. "Our previous work here at Illinois has shown that their photosynthesis rates are not stimulated by being at elevated CO₂. They already have high CO₂ inside their leaves."

More research is needed to determine how crops

grown in developing regions of the world will respond to higher atmospheric CO₂, Leakey said.

"It's important that we start to do these experiments in tropical climates with tropical soils, because that's just a terrible gap in our knowledge, given that that's where food security is already the biggest issue," he said.

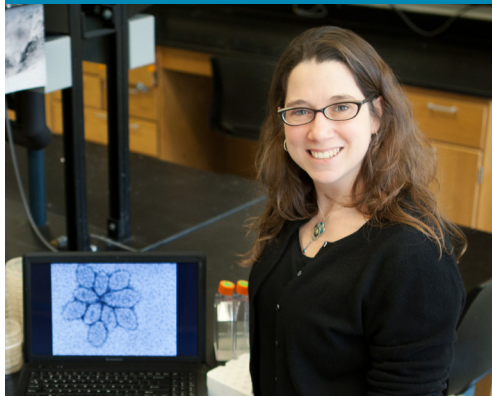
The collaboration included researchers from Harvard University (which led the effort); Ben-Gurion University of the Negev, in Beer Sheva, Israel; the U. of I.; the University of California, Davis; the U.S. Department of Agriculture's Agricultural Research Service; the National Institute for Agro-Environmental Sciences in Ibaraki, Japan; the University of Melbourne, Australia; the University of Arizona; the University of Pennsylvania; and The Nature Conservancy, Santa Fe, New Mexico. ■

Written by Diana Yates. Photo by L. Brian Stauffer.



Free Air Concentration Enrichment (FACE) systems, like soyFACE at Illinois, allow researchers to simulate future atmospheric conditions to determine their effects on plants. Photo by Don Hamerman.

PROFILE



Rachel Whitaker is an Associate Professor of Microbiology, whose research interests include evolutionary dynamics in Archaeal genomes and environmental genomics.

Rachel Whitaker: An Evolutionary Career

When microbiologist Rachel Whitaker (BCXT) graduated from college, she didn't know if she wanted to be a teacher or a researcher. So, like any good scientist, she tested her hypotheses.

Through AmeriCorps Vista, she helped kids K-2 learn to read as a program coordinator for S.M.A.R.T (Start Making a Reader Today), a state-wide reading program in Oregon.

Then to try research science, she worked for three years as a researcher in a cancer immunology lab at Providence Medical Center in Portland Oregon. Although laboratory science won her heart, the medical sciences did not particularly appealed to her. So she went back to the drawing board.

At the library, Whitaker poured over scientific literature to see what scientific field intrigued her. That day, she happened to read an issue of *Science* on microbial biology, featuring Carl Woese's discovery of archaea.

"I was interested in a lot of different things, but as soon as I read that article, I knew that was what I wanted to do," she said. "How would you not want to study the third domain of life? I never looked back."

At this point, Whitaker had been out of school for five years. But in retrospect, she said this break helped rather than hurt her career. As a graduate student at the University of California, Berkeley, she wrote her own grant proposals and conducted an independent research project funded by NASA. After she earned her doctorate in microbiology, she worked for a year as a postdoctoral researcher at UC Berkeley before landing her dream job as an Assistant Professor in the Microbiology Department at the University of Illinois.

Since then, the field has been rapidly evolving.

"When I started in grad school, we were just starting to understand the diversity of microorganisms," she said. "Now, thanks to genomics, we have come

to realize the uniqueness of the Archaeal domain particularly in terms of basic DNA processes like DNA replication, repair and recombination. By examining genomes in natural populations, we have learned how these processes affect the evolution of

"Thanks to genomics, we have come to realize the uniqueness of the Archaeal domain particularly in terms of basic DNA processes like DNA replication, repair and recombination. By examining genomes in natural populations, we have learned how these processes affect the evolution of microbial diversity."

microbial diversity. And, not only is there this amazing diversity in microbes, but there is also ten times more diversity in viruses of microbes. This whole other world is opening up."

Through her work at the IGB, she studies evolutionary dynamics in Archaeal genomes and compares how viruses interact with microbes and evolve over time through experimental evolution and environmental genomics.

"It's just amazing to me how little we know about natural variation and coevolution of viruses of microbes," Whitaker said.

At the Institute for Universal Biology, housed at the IGB, she is also joining forces with an interdisciplinary group that is working together to pick up where Woese left off, studying how life began and has since evolved.

Her work has truly come full circle since she picked up that issue of *Science* featuring Woese.

As Woese served as a role model for generations of scientists who have admired his unique perspective and tenacity, Whitaker will undoubtedly serve as a role model for future scientists: She doggedly pursued her dream of being a scientist, achieved tenure while raising a family, and continues to serve as an example of a successful woman in a STEM field saturated by men.

"A lot of people ask me often if I'm a role model," Whitaker said. "I don't think so because everybody has to develop a career in science in his or her own way. The only thing I would say is you can do it! In your own way, you can do it."

Whitaker studied biology at Wesleyan University and went on to earn her doctorate in microbiology from the University of California, Berkeley. ■

Written by Claire Sturgeon. Photo by Kathryn Coulter.



The research was conducted on microbes found in a single geothermal hot spring in the Mutnovsky Volcano region of Kamchatka, Russia. Photo by Rachel Whitaker.

ON THE GRID

HAPPENINGS AT THE IGB

SMARTPHONE APP



GAIT TRACK

By simply carrying around their cellphones, patients who suffer from chronic disease could soon have an accurate health monitor that warns their doctors when their symptoms worsen. Unlike apps that merely count steps, GaitTrack, an app developed by researchers at the University of Illinois including professor of computer science Bruce Schatz, uses eight motion parameters to perform a detailed analysis of a person's gait, or walking pattern, which can tell physicians much about the patient's cardiopulmonary, muscular and neurological health.

View a short video interview with Schatz [here](#).

CAMP



POLLEN POWER! SUMMER CAMP RETURNS

Once again the IGB will be hosting Pollen Power!, a week-long day camp for talented girls who are interested in the biological sciences.

This year's camp will take place July 7-11, 2014.

Registration is closing soon! Don't miss your chance to be a part of camp this year. Register at <http://pollensummercamp.illinois.edu>

AWARDS



ISAAC CANN

Professor of Animal Sciences Isaac Cann was awarded the Paul A. Funk Recognition Award by the College of ACES, presented to faculty and academic professionals for outstanding achievement and major contributions to the betterment of agriculture, natural resources, and human systems. View the video [here](#).



BRIAN CUNNINGHAM

Brian Cunningham, professor of Bioengineering and of Electrical and Computer Engineering, has been selected to receive the 2014 Technical Achievement Award from the Institute of Electrical and Electronics Engineers (IEEE) Engineering in Medicine and Biology Society (EMBS), the world's largest international society of biomedical engineers.



WILFRED VAN DER DONK

Professor of Chemistry Wilfred van der Donk was elected to the American Academy of Arts and Sciences, one of the longest-standing honorary societies in the nation.



SHARON DONOVAN

Professor of Nutrition Sharon Donovan received the Spitze Land-Grant Professorial Career Excellence Award from the College of ACES, to recognize the performance and commitment of tenured faculty in their professorial career. View the video [here](#).



STEPHEN MOOSE

Professor of Crop Sciences Stephen Moose received a Faculty Award for Excellence from the College of ACES, recognizing outstanding professional achievement and demonstrated excellence in the areas of teaching, research, and extension. View the video [here](#).



SUA MYONG

Sua Myong, Assistant Professor of Bioengineering, received the Rose Award for Teaching Excellence, created to foster and reward excellence in undergraduate teaching in the College of Engineering.

ON THE GRID

HAPPENINGS AT THE IGB

PUBLICATION



SCIENCE MAGAZINE PERSPECTIVE

Don Ort, Professor of Plant Biology, with Stephen Long, Professor of Crop Sciences and Plant Biology, discuss corn belt yield limits in a recent perspective in *Science* magazine.

Read the **full article** on the *Science* website.

SYMPOSIUM



2014 IGB FELLOWS SYMPOSIUM

Thank you to all the attendees at the IGB Fellows Symposium, and to speakers John Gerlt, Huimin Zhao, Whitney England, Taekjip Ha, Bo Wang, Lisa Stubbs, and keynote Sue Wessler.

Many of the talks exemplified the collaborative nature of the IGB by referencing work mentioned in other presentations and themes, sowing the seeds for possible new collaborations between the themes.

The latest results of some ongoing projects as well as previews of several large new grants in process were also discussed, showcasing our diverse and exciting research portfolio.

CONFERENCE



EBI BIOFUELS LAW AND REGULATION CONFERENCE

The Environmental Protection Agency's Renewable Fuel Standards (RFS) were a hot topic of discussion at the Sixth Annual Energy Biosciences Institute (EBI) Law and Regulation Conference, held at the University of Illinois on May 2.

Conference attendees heard multiple viewpoints about how the EPA should address the RFS going forward.

To learn more, visit the conference website at <http://www.biofuellawconference.org/> where the talks will be available.

CEM



CERTIFICATE IN ENTREPRENEURSHIP AND MANAGEMENT

Congratulations to the winners of the CEM Elevator Pitch Competition:

First Place: PhotoniCare

Ryan Shelton, Franklyn Rocha Cabrero, Shenghan Jin

Second Place: Lienya Pharmaceuticals, Inc.

Ting Fu, Jason Bouvier, Andrew Fu, Huan Wang

Third Place: Vessel Restore

Kwame Darfour-Oduro, Richard Graybill, William Grier

SERVICE



SERVICE AWARDS

Congratulations to the following IGB employees who are celebrating milestones in their years of service at the University of Illinois:

5 Years: Carlos Spinks

15 Years: Elizabeth Stull

25 Years: Martha Lillard

30 Years: Barbara Jauhola

GIVING



WALK OF LIFE

Located to the west of the IGB building, adjacent to the historic Morrow Plots, the Walk of Life pays tribute to the historical discoveries that enable our work on the cutting edge of genomic research. Contributing to the Walk of Life is a unique opportunity to simultaneously support our mission and become a permanent part of IGB history.

More information can be found at www.igb.illinois.edu/about/giving

ADMINISTRATIVE NEWS

BUSINESS

FY15 BENEFIT CHOICE ENROLLMENT FOR UNIVERSITY OF ILLINOIS EMPLOYEES

The FY15 Benefit Choice period will begin on Thursday, May 1, 2014 and end on Monday, June 2, 2014 with an effective date of July 1, 2014.

Please visit the NESSIE website at <http://nessie.uihr.uillinois.edu/> for Benefit Choice news and announcements. UPB has scheduled three Benefit Choice information sessions on campus during the month of May 2014. The sessions will cover the benefit changes that take effect July 1, the changes that employees can make during the Benefit Choice period, general benefit information and a Q & A. Registration is NOT required.

Below is a list of the scheduled informational sessions offered by University Payroll & Benefits Services (UPB):

First Session

Tuesday, May 6, 2 p.m.

Ikenberry Commons

SDRP Multipurpose Room 2025 Room A,B & C

301 E. Gregory, Champaign, IL 61820

Second Session

Wednesday, May 14, 10 a.m.

Beckman Auditorium 1025

405 N. Matthews, Urbana, IL 61801

Third Session

Tuesday, May 20, 2 p.m.

Bevier Hall, Room 180

905 S. Goodwin (Goodwin and Gregory Drive), Urbana, IL 61801

These events are approved events under Civil Service Policy and Rules, Rule 11.12. Employees may be released from work to attend a session, University operations permitting, and subject to prior supervisor approval.

Questions? Send an e-mail to benefits@uillinois.edu or contact the University Payroll and Benefits Services office at (217) 333-3111. ■

COMMUNICATIONS

MEET THE SCIENCE WRITERS

Enjoy free pizza and meet the IGB's science writers who are on staff to help you publicize your research, grants and awards. Also, share your thoughts on what communications services would be most helpful to you.

Pizza is available first come first serve from 11 a.m. to 1 p.m. on Thursday, June 19, in 612 IGB. ■

UNIVERSITY LIBRARY

NEW VERSION OF THE DMPTOOL

At the end of May 2014, a new version of the DMPTool (<https://dmp.cdlib.org/>) will be released. The DMPTool is an online wizard for creating data management plans, and it supports plans for a variety of funding agencies, including individual NSF directorates and NIH. The University of Illinois at Urbana-Champaign was one of the original contributing institutions that developed the DMPTool, and since UIUC is a contributing institution, UIUC faculty, staff and students can login to the DMPTool with their NetID and password.

New DMPTool features and functionality include:

- **Co-Owners:** Plan creators can designate individuals as co-owners of specific plans, which allows the co-owners to edit and provide feedback on the plans within the DMPTool.
- **Reviews:** Plan creators can request feedback on their plans. At UIUC, librarians who are knowledgeable about data management requirements and resources will complete the reviews. Reviewers will comment on plans within the DMPTool.
- **Institutional Customization:** The University Library will include language and links for institutional resources, such as IDEALS (the institutional repository), and contact information for local data management assistance.
- **Updated Interface:** The new version displays resource links and suggested responses in tabs and has new visuals.

If you have questions about the DMPTool or data management plans, please contact Sarah Williams, the Life Sciences Data Services Librarian, at scwillms@uillinois.edu. ■

OPERATIONS & FACILITIES

ARRAY CAFE

Have you heard about the latest changes at Array Cafe?

- **Prices have been reduced** – check out the new Array menu to see the changes! Even token prices are lower!!
- We have a new Array Blend coffee from Columbia Street Roastery!
- We have bagels and cream cheese from Einsteins Bagels!
- We have new salads, sandwiches and wraps from Michaels' Catering, including the popular Cuban sandwich on Tuesdays!
- We have new menu items including baked potatoes, baked sweet potatoes, mac & cheese and more!

Don't forget that Array Cafe will be open all summer long, from 8:00 a.m. to 3:00 p.m, Monday through Friday.

Check out the entire menu in the café or **online**. While you're there, keep filling out the short survey – we value your feedback!

<http://www.igb.uillinois.edu/content/array-cafe-survey> ■

SAFETY

SAFELY USING A BIOLOGICAL SAFETY CABINET

Biological safety cabinets (BSCs) are among the most effective primary containment devices used in laboratories working with infectious agents. They act as primary barriers to prevent the escape of biological aerosols into the laboratory environment. This is an important function, because most laboratory techniques (e.g., pipetting, vortexing, sonicating) are known to produce inadvertent aerosols that can be readily inhaled by the laboratory worker.

Theme PIs using biosafety cabinets should train all of their researchers on how to safely use a biosafety cabinet and document this training on a written sign in sheet. Always follow the procedures below when working in a biosafety cabinet.

Planning

- Thoroughly understand procedures and equipment required before beginning work.
- Arrange for minimal disruptions, such as room traffic or entry into the room, while the cabinet is in use.

Start-Up

- Turn off UV light if in use. Ensure that the sash is set in the correct operating position.
- Turn on fluorescent light and cabinet blower.
- Check the return air grilles for obstructions, and note the pressure gauge reading.
- Allow the cabinet to operate unobstructed for at least fifteen minutes.
- Wash hands and arms thoroughly with soap.
- Wear a long sleeved lab coat with knit cuffs and over-the-cuff gloves.

Surface Decontamination – before work

- Wipe down the interior surfaces of the cabinet with 10% bleach, followed in 5 to 10 minutes with 70% ethanol to prevent pitting of the stainless steel, and allow to dry.

Loading Materials and Equipment

- Only load the materials required for the procedure. Do not overload the cabinet.
- Do not obstruct the front, side, or rear return air grilles.
- Large objects should not be placed close together. After loading the cabinet, wait two to three minutes to purge airborne contaminants from the work area.

Read the full article on the [DRS website](#). ■

RECENT PUBLICATIONS

Kim JN, Henriksen ED, Cann IKO, Mackie RI. Nitrogen utilization and metabolism in *ruminococcus albus* 8. *Appl Environ Microbiol*. 2014;80(10):3095-3102.

Kolossov VL, Hanafin WP, Beaudoin JN, et al. Featured article: Inhibition of glutathione synthesis distinctly alters mitochondrial and cytosolic redox poise. *Exp Biol Med*. 2014;239(4):394-403.

Sarmiento F, Long F, Cann I, Whitman WB. Diversity of the DNA replication system in the archaea domain. *Archaea*. 2014;2014.

Wang AA, Paige KN, Gaskins HR, Teran-Garcia M. An improved method for collecting breath from 3- to 7-year-old children. *J Parenter Enter Nutr*. 2014;38(4):S07-S09.

Watanabe J, Hattori M, Berriman M, et al. Genome sequence of the tsetse fly (*glossina morsitans*): Vector of african trypanosomiasis. *Science*. 2014;344(6182):380-386.

Boyd V, Yoon H, Zhang C, et al. Influence of Mg²⁺ on CaCO₃ precipitation during subsurface reactive transport in a homogeneous silicon-etched pore network. *Geochim Cosmochim Acta*. 2014.

Li K, Schurig-Briccio LA, Feng X, et al. Multitarget drug discovery for tuberculosis and other infectious diseases. *J Med Chem*. 2014;57(7):3126-3129.

McGrath JM, Long SP. Can the cyanobacterial carbon-concentrating mechanism increase photosynthesis in crop species? A theoretical analysis. *Plant Physiol*. 2014;164(4):2247-2261.

Gaskins HR. Host and intestinal microbiota negotiations in the context of animal growth efficiency. *Gut Effic ; The Key Ingred in Pig and Poult Prod : Elev Anim Perform and Health*. 2008:29-37.

Arundale RA, Dohleman FG, Voigt TB, Long SP. Nitrogen fertilization does significantly increase yields of stands of *miscanthus x giganteus* and *panicum virgatum* in multiyear trials in illinois. *BioEnergy Res*. 2014;7(1):408-416.

Kumar R, Zhao S, Vetting MW, et al. Prediction and biochemical demonstration of a catabolic pathway for the osmoprotectant proline betaine. *mBio*. 2014;5(1).

Kromdijk J, Ubierna N, Cousins AB, Griffiths H. Bundle-sheath leakiness in C₄ photosynthesis: A careful balancing act between CO₂ concentration and assimilation. *J Exp Bot*. 2014.

Wang M, Zhao H. Characterization and engineering of the adenylation domain of a NRPS-like protein: A potential biocatalyst for aldehyde generation. *ACS Catalysis*. 2014;4(4):1219-1225. ■



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