

IGB NEWS

Upcoming Events

Monthly Profiles

Happenings at IGB

Image Of The Month

Research News

Department Announcements

Volume 14 Number 7

UPCOMING EVENTS

IGB Seminar - EIRH

The Mechanics of the Vagina: Deformations, Contractions, and Tears

November 30, 2021, 12:00 p.m.

[Join via Zoom](#)

Raffaella De Vita, PhD
Virginia Polytechnic Institute and State University; Associate Department Head, Biomedical Engineering and Mechanics

IGB Lunchbox Series

Get to know your community over lunch

December 1, 2021, 12:00 p.m.

[Join via Zoom](#)

Joe Metz
Assistant Meat Lab Manager, University of Illinois Urbana-Champaign
“Cuts and Cuisine: How food culture impacts the meat business”

David Chih
Director of Asian American Cultural Center, University of Illinois Urbana-Champaign
“Chinese birthday noodles: Holding on to cultural traditions through food”

Lunch with the Core

Imaging molecular solvation structures at the angstrom scale

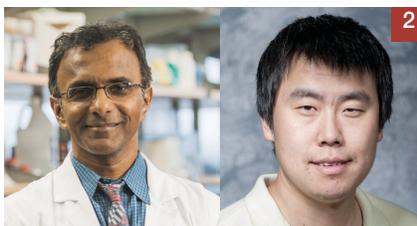
December 9, 2021, 12:00 p.m.

612 Conference Center Carl R. Woese Institute for Genomic Biology

Yingjie Zhang, PhD
Professor of Material Sciences and Engineering

To go lunches will be provided.

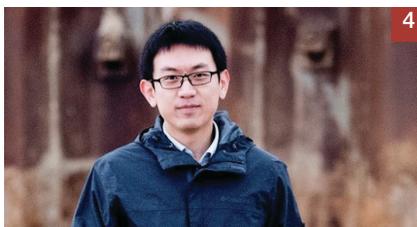
FEATURED NEWS



Mikashi Awards winners announced



Antibiotics penetrate Gram-negative bacterial cell walls

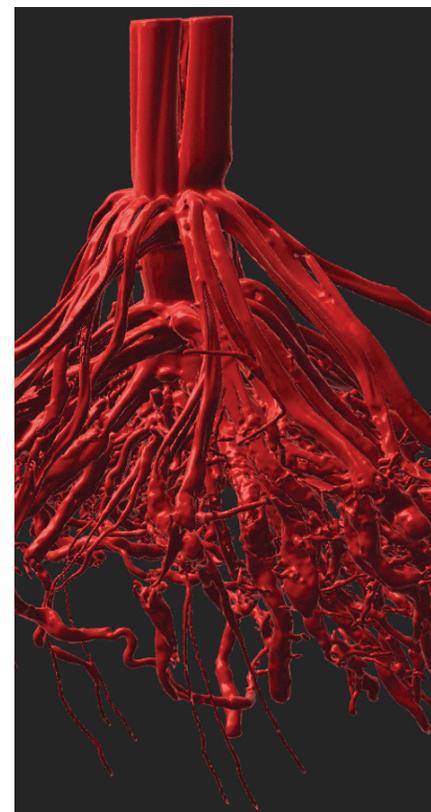


Monthly Profile: Sheng Wang



On the Grid: Happenings at IGB

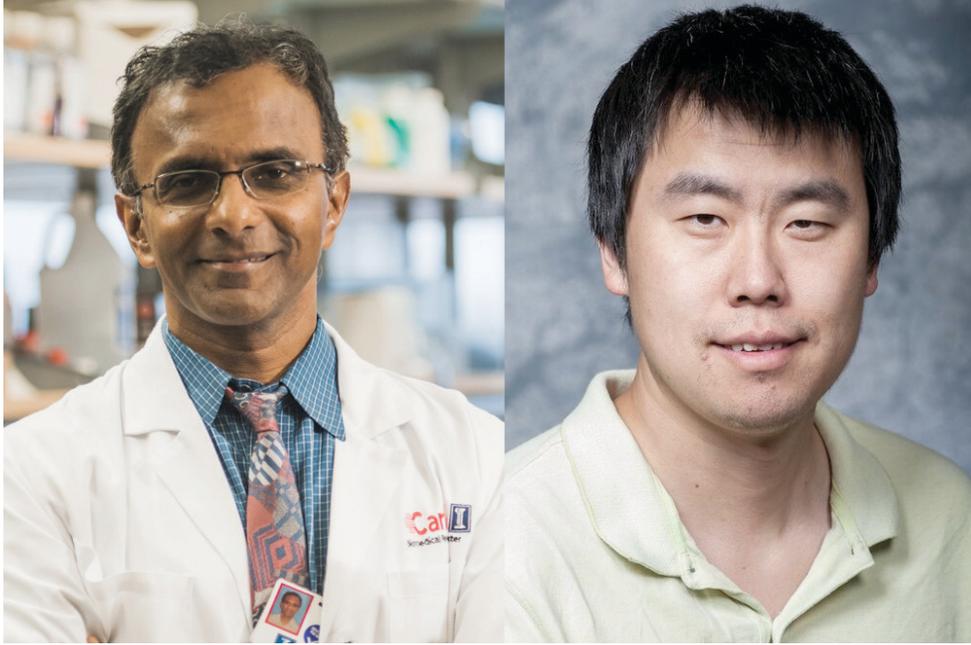
IMAGE OF THE MONTH



This image depicts crown root from biomass sorghum, grown in the field under restricted water supply using the campus rain-out facility as part of the CABBI project. This Image was taken using the X5000 NSI High-Resolution Micro-CT and rendered in Imaris at the Carl R. Woese Institute for Genomic Biology Core facility, courtesy of the Leakey Lab.

IGB News

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



Mikashi Awards winners announced

The Proof-of-Concept Program, named the Mikashi Awards, is funded by the Catherine and Don Kleinmuntz Center for Genomics in Business and Society (Kleinmuntz Center) to support IGB faculty with their innovations. The 2021 winners are Joseph Irudayaraj (CGD/EIRH/MME), a Founder Professor in Bioengineering, and Xing Wang (CGD), a Research Associate Professor of Chemistry. The awards will help them bridge the funding “gap” between government-supported innovations that result from university research and the private sector support which converts these innovations into commercial products. The funds will help transform the researchers’ discoveries and technologies into useful products and services that will benefit society.

Wang’s project will involve creating a rapid, sensitive, and cheap virus-sensing technology with DNA nanostructures. These star-shaped DNA structures can recognize and capture viral particles and emit a fluorescent signal, which can be read instantly with lab equipment. Since the sensing mechanism does not depend on the amplification of genetic material, the method circumvents the tedious process of extracting and purifying nucleic acid material from the virus. Additionally, nucleic acid tests can generate false-positive results if there are degraded viral particles in the sample, a complication that can be bypassed by the new technology. Using the award, the Wang lab will continue developing probes

to detect influenza and HIV in both a home setting and at medical diagnostic centers. The tests will take

2021 Mikashi Award winners include Joseph Irudayaraj, left, a Founder Professor in Bioengineering, and Xing Wang right,, a Research Associate Professor of Chemistry.

less than ten minutes and will cost less than \$0.50 per test.

Irudayaraj will work to treat retinal artery occlusion, a condition where the retinal arteries are blocked resulting in irreversible blindness. He will use oxygen nanobubbles to deliver the gas and thereby preserve the retinal tissues. Unfortunately, there is no standardized treatment for the condition. Irudayaraj hopes that the FDA approval could be expedited because the condition is characterized as an orphan disease—the number of cases is less than 200,000 in the USA. The funding from the awards will help the team collect data and submit an Investigational New Drug application to the FDA. They will test

the commercial feasibility of the technology, work on mitigating risks for potential clients, and explore potential investors and licensing. ■

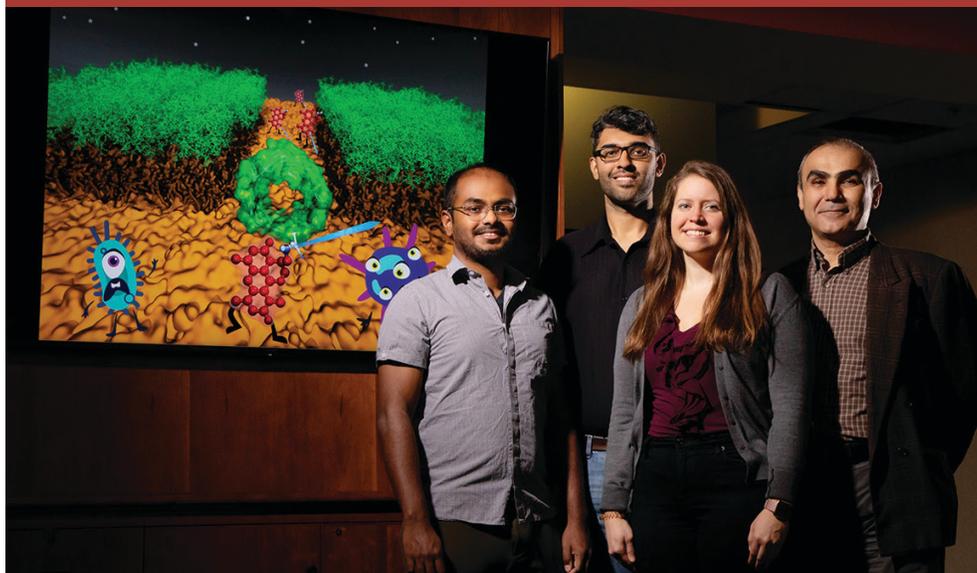
Written by Ananya Sen. Photos by L. Brian Stauffer.



**KLEINMUNTZ
CENTER**

The Catherine and Don Kleinmuntz Center for Genomics in Business and Society (Kleinmuntz Center) provides unique opportunities for economic development, public engagement, and social impact through genomics and business. The Kleinmuntz Center is committed to supporting innovation and commercialization taking place at the Carl R. Woese Institute for Genomic Biology at the University of Illinois Urbana-Champaign.

RESEARCH



Scientists discover how antibiotics penetrate Gram-negative bacterial cell walls

Scientists have labored for decades to find antibiotics that work against Gram-negative bacteria, which cause some of the deadliest infections in hospital settings and are most likely to be resistant to treatment with existing antibiotics. In a study reported in the journal *Chemical Science*, researchers developed a new method to determine how antibiotics with specific chemical properties thread their way through tiny pores in the otherwise impenetrable cell envelopes of Gram-negative bacteria.

“Antibiotic resistance is a major clinical problem now in the world,” said University of Illinois Urbana-Champaign biochemistry professor Emad Tajkhorshid (right), who led the study with biophysics Ph.D. students Nandan Haloi (left) and Archit Kumar Vasan (second from left), and biochemistry research scientist Po-Chao Wen. “Tens of thousands of people die each year in the U.S. as a result of untreatable bacterial infections, and the problem is even worse in other parts of the world.”

Most of these infections are attributable to Gram-negative bacteria, which have a hard outer cell membrane that many antibiotics fail to penetrate, Tajkhorshid said. In 2017, U. of I. chemistry professor and current study co-author Paul Hergenrother (ACPP leader/MMG) reported in the journal *Nature* that his team had determined a set of chemical rules for antibiotic compounds that could pass through Gram-negative bacterial membranes. Using this guidance, Hergenrother and his colleagues successfully converted antibiotics that worked only against Gram-positive bacteria into effective killers of Gram-negative microbes, which are much harder to treat.

One key to that discovery was that some antibiotics could use specific membrane pores to penetrate the cell membranes of Gram-negative bacteria if chemists added a positively charged group, for

example an amine, to them, Tajkhorshid said. While experiments proved the idea worked, the researchers did not understand precisely why it worked.

To gain a better understanding, the scientists had to determine at a microscopic level how the antibiotic interacted with different parts of the bacterial pore as it passed through. One approach to tracking molecular interactions involves the use of supercomputers to model the chemical characteristics of every atom in a system and run simulations that reveal how the system behaves. This technique, called “molecular dynamics simulation,” is computationally intensive, however, and may not track the molecular behavior of a complex system in full, Tajkhorshid said.

To reduce the computational load, Haloi and Vasan developed a method that generated the most likely pathway for the antibiotic as it wriggled through the pore, then allowed their molecular dynamics simulations to help them calculate the energetics of each potential step. They ran the simulations for the antibiotic with and without the amine group attached.

“Every potential pathway through the pore has an energy associated with it, and we are looking for the pathway that is energetically most favorable,” Tajkhorshid said.

This effort revealed that the positively charged amine group on the antibiotic interacted favorably with negative charges lining the bacterial pore, he said. These attractive forces allowed the antibiotic with the amine group to line up in an energetically more favorable manner as it threaded its way through the narrowest part of the pore, called the constriction zone. The antibiotic without the amine faced a higher energy barrier to passage through the pore.

Mutation experiments – performed by chemistry Ph.D. student Emily Geddes (second from right) in

the Hergenrother lab with U. of I. microbiology professor William Metcalf (MMG leader) – confirmed that the interaction between the amine and negatively charged regions of the pore enabled passage of the antibiotic into the bacterium.

“Understanding the precise mechanisms that allow potential antibiotics to penetrate Gram-negative bacterial cell membranes will allow scientists to design new drugs – or modify old ones – to attack and kill microbes that are otherwise resistant to treatment with antibiotics,” Vasan said.

The technique developed to lessen the computational resources needed to address complex problems like this one also will be useful for other explorations of molecular biology, Tajkhorshid said.

“We can use these methods to explore other disease-related processes that involve, for example, interactions between chemical compounds and proteins, how drugs bind their receptors in the body or how specific chemical groups in an antibody bind to surface antigens on a virus,” Haloi said.

“Although we developed our method to study barrel-shaped proteins, this approach should be generally applicable to many other systems,” Wen said.

The National Institutes of Health and National Science Foundation supported this research. The computational work was performed on the Blue Waters supercomputer at the National Center for Supercomputing Applications at the U. of I.

Tajkhorshid is the director of the NIH Center for Macromolecular Modeling and Bioinformatics at the Beckman Institute for Advanced Science and Technology at the U. of I., where Haloi, Vasan and Wen also work. ■

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



Sheng Wang is a Research Assistant Professor at the Department of Natural Resources and Environmental Sciences (NRES) and a Research Scientist at the Agroecosystem Sustainability Center (ASC) at the Institute for Sustainability, Energy, and Environment (ISEE).

Sheng Wang Research Assistant Professor

When chatting with Sheng Wang, you instantly feel his passion for research. As an environmental scientist working on bioenergy crop monitoring, he takes pride in his work knowing that his research efforts contribute to tackling environmental concerns such as climate change and increased carbon emission. Wang's inspiration to pursue environmental science stemmed from the natural surroundings in his hometown.

Originally from Southwest China, Wang grew up in a mountain city called Chongqing with the Yangtze River, the largest river in China, flowing through. Surrounded by mountains, water, and gorges, Wang became fond of nature and its beauty. "My hometown has one of the best primaeval forests of the same latitude in the world and is also close to the giant panda habitat," he said. "This also motivated me to explore nature."

After completing his BS in Geography at Nanjing University, Wang moved to Europe, in his first international experience of studying abroad. He received his double masters degree in Geography and in Water and Environment, a cooperation between the Chinese Academy of Sciences, in China, and the University of Copenhagen, in Denmark. After that, he developed airborne sensing systems to monitor willow bioenergy plantations at Risø National Laboratory for Sustainable Energy and received his PhD in Environmental Engineering from the Technical University of Denmark. "As an environmental enthusiast, I really like the Nordic lifestyle of cycling to work. I also like Copenhagen, which has strong ambitions to become the world's first carbon-neutral city by 2025," Wang said.

In the same year, Wang continued to travel the world and familiarize himself with different cultures, moving to UIUC in 2019. "I was attracted to the advanced research in biology, agriculture, and computer science here at the University of Illinois," Wang said. "The University of Illinois is a good environment for collaborating with students and

professors on interdisciplinary research." Here, he continues working as a research scientist in Kaiyu Guan's (CABBI) lab where he works at the interface of biology, ecology, artificial intelligence and agroecosystems. "I enjoy working with great scientists here like Dr. Kaiyu Guan and Dr. Lisa Ainsworth (CABBI/GEGC). They always give great inspiration to my research," Wang said.

Specifically, his research focuses on "leveraging satellite and airborne remote sensing technology along with artificial intelligence for monitoring large-scale

“在不同国家学习工作，
这让我非常幸运体验到了不同风土文化。”

*"I'm quite lucky I could experience
different cultures since I used to
work and study in different countries
around the world."*

bioenergy crop traits, soil properties, and farming management practices for sustainable agriculture in the US Corn Belt, the food basket of the world." Wang's approaches are used to address how climate and human practices affect bioenergy crop nutrients, productivity and ecosystem functioning.

"I am very enthusiastic about disseminating our research to the public to improve public awareness of climate change, environmental sustainability and carbon issues," Wang said. "It's important that we raise awareness for environmental concerns through outreach and dissemination events."

Most recently, Wang participated in the first year of the newly-formed Young Innovator Program, a collaboration between the Catherine and Don

Kleinmuntz Center for Genomics in Business and Society and the IGB. The program challenged trainees to become innovative leaders in their fields by bringing their science to society, culminating in a final presentation that highlighted a real-life problem and its solution.

When asked about his participation in the Young Innovator Program, he described it as "an amazing experience that other IGB postdocs and graduate students should also experience. I learned a lot of knowledge on how to make market sizing surveys, how to file IP and protect innovations, and how to link our current research with societal potential," he said. "I am thankful to Dr. Catherine Kleinmuntz, the Kleinmuntz Center, and the IGB for this opportunity."

When asked about the pandemic, Wang mentioned having to adjust his work style. "During the beginning of the pandemic, everything changed and we had to work from home. My research was affected because we were short-handed at that time and so we didn't have a lot of people who could go to the field to collect data," he said. Wang found himself jogging more often after realizing how "we are always working from home with very limited physical exercise."

"The pandemic gives us a brief lesson on how anthropogenic activities influence global society," Wang said. "We need to not only be aware of climate change but try to reduce our carbon footprint and make our environment more sustainable by developing new technology for renewable energy. In my hometown, we have around 80% of the energy coming from renewable hydropower. Renewable energy technology, for example bioenergy, is very important for the future of humankind." ■

Written by Joana Bordalo and Alisa King-Klemperer. Photo by Sheng Wang.

ON THE GRID HAPPENINGS AT THE IGB

AWARDS



JONATHAN SWEEDLER ROHIT BHARGAVA

Jonathan Sweedler, James R. Eiszner Family Endowed Chair in Chemistry (BSD/CABBI/MMG) and Rohit Bhargava, Founder Professor in Bioengineering (CGD) were named to the Analytical Scientist's 2021 Power List highlighting tremendous talent, ingenuity, and leadership in analytical science across the world, with Sweedler receiving the #1 ranking.



JEFFREY MOORE

Jeffrey Moore, Professor of Chemistry and Materials Science & Engineering (BSD), was awarded the Campus Executive Officer Distinguished Leadership Award, which recognizes outstanding academic leadership and vision by an executive officer within a college or campus unit.

NEW ARRIVALS



SHEENA MARSHALL

Sheena Marshall, a native of Champaign, IL. Sheena recently joined IGB as an Account Technician. Prior to joining IGB, she worked at FMS Solutions as an Account Clerk. Sheena's philosophy is live, love, laugh and enjoy life!

FUNDING



SIMBIOSYS RAISES \$15 MILLION IN SERIES A FUNDING

SimBioSys raised \$15 million in Series A funding to accelerate the development and commercialization of its TumorScope software platform. The company's novel, simulation-based, precision medicine platform enables individualized treatment planning for cancer patients.

Founded in 2018 at the University of Illinois Urbana-Champaign, SimBioSys is based at the EnterpriseWorks incubator in the University of Illinois Research Park. Chief Technical Officer at SimBioSys, Joe Peterson, was a former participant in the the IGB's Fox Family Innovation and Entrepreneurship Lecture Series and Certificate Program. Read the full story [here](#).

ART OF SCIENCE



ART OF SCIENCE AT ILLINI UNION ART GALLERY

Pieces from the IGB's Art of Science program will be featured in the Illini Union Art Gallery through November 25th. The Art of Science is a celebration of common ground between science and art. Each exhibit comprises images from IGB's research portfolio, enhanced to highlight the beauty and fascination encountered daily in scientific endeavors. The Art of Science includes subjects from the microscopic to the holistic, from the physical to the abstract.

Illini Union Art Gallery, 1st Floor Illini Union, 1401 West Green Street, Urbana.

FEATURE



BBC'S FOLLOW THE FOOD FEATURES RIPE RESEARCH

The Realizing Increased Photosynthetic Efficiency (RIPE) project was featured on the October 29th episode of Follow the Food on BBC World News. Hosted by world-renowned ethnobotanist James Wong, the multimedia series focuses on the biggest pressures on the world food system including RIPE's central mission of how to feed the growing population, and climate change, which is the focus of the current season. For info on how to watch the episode read the full article [here](#).

LUNCHBOX



FINAL LUNCHBOX SERIES DECEMBER 1

The final talk of our newest series where we highlight the intersection of food, science, and culture will take place on December 1st and feature Joe Metz, Assistant Meat Lab Manager, and David Chih, Director of Asian American Cultural Center, both from UIUC. Our speakers will present separately for the presentation "Get to know your community over lunch."

Join us via Zoom on December 1st at noon!

DEPARTMENT ANNOUNCEMENTS

BUSINESS

STAFF CHANGES

Just a reminder, with the retirement of several members of the IGB Business Office there have been some role changes:

Department card management, formerly Carla Dickey, is now Renee Pro-fancik (reneepro@illinois.edu).

Receipt requests for P/T card purchases will be made by Alana King (abking@illinois.edu) and Stephanie Helfrich (skh1@illinois.edu).

As always, anyone who needs assistance should email purchasing@igb.illinois.edu and a business office members will get in touch. ■

OTM

ADOBE SIGN

The Office of Technology Management is opening a new round of funding through our Illinois Proof of Concept (IPOC) program. The IPOC program awards funding to development projects that move UIUC innovations closer to licensing and commercial or public use. IPOC bridges the funding “gap” between the government-supported innovations that result from UIUC research and private sector translation of those innovations into products and services.

We are seeking proposals that represent the breadth and depth of campus research and that have the potential for positive societal impact across a variety of areas. Awards can be up to \$50,000.

The application deadline is December 17, 2021. The application consists of some basic information and a short project description (up to 3 pages). Applications will be reviewed by an internal committee. Finalists will be invited to present to an external committee. We anticipate awardees will be announced in early spring 2022.

Program website with more information & the application: <https://otm.illinois.edu/IPOC> ■

O&F

IGB HOLIDAY SCHEDULE AND BUILDING INFORMATION

Thanksgiving: November 25 & 26
Christmas & New Year’s Day Holiday
December 24-January 3

The IGB building, which includes administrative offices, purchasing, shipping and receiving, and Array Café, will be closed. Full services will resume on Tuesday, January 4.

- All exterior doors will continue to be locked, and card access doors only accessible with a valid IGB prox card.
- Check your i-Card expiration date
- Access is automatically deactivated if your i-Card expires on or before December 31, 2021. You must renew your i-Card at the i-Card Center prior to December 20, 2021.
- Do not place orders for packages for delivery December 24-January 3. No packages or mail will be received or sent during this time by IGB Shipping and Receiving. Questions related to shipping, receiving, or email should be directed to receiving@igb.illinois.edu.
- Questions related to purchasing should be directed to the IGB Business Office at purchasing@igb.illinois.edu.
- Turn off all lights when you leave your area.
- If you notice any urgent building issues (water leaks, CT room temperature problems, etc.) call the Public Safety Dispatch Office at 217-333-0340 for off-hours assistance.
- During holiday break, emails sent to facilities@igb.illinois.edu will not be immediately addressed.
- “No parking” and permit only parking areas are still enforced. IGB bagged meters on Mathews and IGB dock parking spaces are available by permit only. Ticketing/towing may occur at vehicle owner’s expense if parked in non-assigned space without permit.

Security Reminders

- Take extra care when entering the IGB both via the exterior doors during off-hours and doors leading into secured spaces within the IGB.
- Do not let unknown people into the IGB or secured spaces.
- Anyone needing access should be directed to IGB Operations and Facilities for prox card or key access permissions during regular business hours.
- Be aware of people loitering around doors and grabbing the door before closing behind you to gain access.
- Absolutely NO doors should be propped open to compromise IGB security.
- Be observant of your surroundings and immediately report any suspicious behavior by calling 9-911 from a campus phone.

Safety

- Be aware of the potential for ice forming on streets, sidewalks, parking lots, and the IGB plaza.
- Using customary winter caution is the most important means of protection. Frequently or continuously looks at the walkway in front of you, especially if you suspect slick spots.
- To report persistent areas of ice accumulation, contact the Service Office at 217-333-0340.
- The University of Illinois Public Safety website has helpful information regarding personal safety, as well as other topics of interest: <http://www.dps.uiuc.edu/universitypolice/campussafety.html> ■

RECENT PUBLICATIONS

Please include your connection to the IGB in your author byline when submitting publications, as it will greatly help track potential newsworthy items and increase the possibility of coverage.

Zuo, Q., Band, S., Kesavadas, M., & Madak Erdogan, Z. (2021). Obesity and Postmenopausal Hormone Receptor-positive Breast Cancer: Epidemiology and Mechanisms. *Endocrinology* (United States), 162(12), [bqab195]. <https://doi.org/10.1210/endo/bqab195>

Gill, S., Brehm, E., Leon, K., Chiu, J., Meling, D. D., & Flaws, J. A. (2021). Prenatal exposure to an environmentally relevant phthalate mixture alters ovarian steroidogenesis and folliculogenesis in the F1 generation of adult female mice. *Reproductive Toxicology*, 106, 25-31. <https://doi.org/10.1016/j.reprotox.2021.09.013>

Robison, H. M., Chapman, C. A., Zhou, H., Erskine, C. L., Theel, E., Peikert, T., Lindestam Arlehamn, C. S., Sette, A., Bushell, C., Welge, M., Zhu, R., Bailey, R. C., & Escalante, P. (2021). Risk assessment of latent tuberculosis infection through a multiplexed cytokine biosensor assay and machine learning feature selection. *Scientific reports*, 11(1), [20544]. <https://doi.org/10.1038/s41598-021-99754-3>

Liu, S., Carlson, E. W., & Dahmen, K. A. (2021). Connecting Complex Electronic Pattern Formation to Critical Exponents. *Condensed Matter*, 6(4). <https://doi.org/10.3390/condmat6040039>

Adams, A. N. D., Azam, M. S., Costliow, Z. A., Ma, X., Degnan, P. H., & Vanderpool, C. K. (2021). A novel family of RNA-binding proteins regulate polysaccharide metabolism in bacteroides thetaiotaomicron. *Journal of bacteriology*, 203(21), [e00217-21]. <https://doi.org/10.1128/JB.00217-21>

Kalafatis, M., & Schlauch, J. M. (2021). Long-distance effects of H-NS binding in the control of hilD expression in the salmonella SPI1 locus. *Journal of bacteriology*, 203(21), [e00308-21]. <https://doi.org/10.1128/JB.00308-21>

Imir, O. B., Kaminsky, A. Z., Zuo, Q-Y., Liu, Y-J., Singh, R., Spinella, M. J., Irudayaraj, J., Hu, W-Y., Prins, G. S., & Madak Erdogan, Z. (2021). Per- and Polyfluoroalkyl Substance Exposure Combined with High-Fat Diet Supports Prostate Cancer Progression. *Nutrients*, 13(11). <https://doi.org/10.3390/nu13113902>

Slovan, S. A., Patterson, R., & Barbey, A. K. (2021). Cognitive Neuroscience Meets the Community of Knowledge. *Frontiers in Systems Neuroscience*, 15. <https://doi.org/10.3389/fnsys.2021.675127>

Haloi, N., Vasan, A. K., Geddes, E. J., Prasanna, A., Wen, P., Metcalf, W. W., Hergenrother, P. J., & Tajkhorshid, E. (Accepted/In press). Rationalizing the generation of broad spectrum antibiotics with the addition of a positive charge. *Chemical Science*. <https://doi.org/10.1039/D1SC04445A>

Jhong, H. R., Nwabara, U. O., Shubert-Zuleta, S., Grundish, N. S., Tandon, B., Reimnitz, L. C., Staller, C. M., Ong, G. K., Saez Cabezas, C. A., Goodenough, J. B., Kenis, P. J. A., & Milliron, D. J. (2021). Efficient Aqueous Electroreduction of CO₂ to Formate at Low Overpotential on Indium Tin Oxide Nanocrystals. *Chemistry of Materials*, 33(19), 7675-7685. <https://doi.org/10.1021/acs.chemmater.1c01649>

Sinha, R., Grimes, W. N., Wallin, J., Ebbinghaus, B. N., Luu, K., Cherry, T., Rieke, F., Rudolph, U., Wong, R. O., & Hoon, M. (2021). Transient expression of a GABA receptor subunit during early development is critical

for inhibitory synapse maturation and function. *Current Biology*, 31(19), 4314-4326.e5. <https://doi.org/10.1016/j.cub.2021.07.059>

Liu, F., Liu, X., Shi, Q., Maffeo, C., Kojima, M., Dong, L., Aksimentiev, A., Huang, Q., Fukuda, T., & Arai, T. (2021). A tetrahedral DNA nanorobot with conformational change in response to molecular trigger. *Nanoscale*, 13(37), 15552-15559. <https://doi.org/10.1039/d1nr02757c>

Lawson, S. L., Enos, J. K., Gill, S. A., & Hauber, M. E. (2021). Eavesdropping on Referential Yellow Warbler Alarm Calls by Red-Winged Blackbirds Is Mediated by Brood Parasitism Risk. *Frontiers in Ecology and Evolution*, 9, [706170]. <https://doi.org/10.3389/fevo.2021.706170>

Li, A., Matsuoka, N., Niu, F., Chen, J., Ge, Z., Hu, W., Li, D., Hallet, B., van de Koppel, J., Goldenfeld, N., & Liu, Q. X. (2021). Ice needles weave patterns of stones in freezing landscapes. *Proceedings of the National Academy of Sciences of the United States of America*, 118(40), [e2110670118]. <https://doi.org/10.1073/pnas.2110670118>

McClelland, S. C., Cassey, P., Maurer, G., Hauber, M. E., & Portugal, S. J. (2021). How much calcium to shell out? Eggshell calcium carbonate content is greater in birds with thinner shells, larger clutches and longer lifespans. *Journal of the Royal Society Interface*, 18(182), [20210502]. <https://doi.org/10.1098/rsif.2021.0502>

Dhaliwal, D. S., Ainsworth, E. A., & Williams, M. M. (2021). Historical Trends in Sweet Corn Plant Density Tolerance Using Era Hybrids (1930–2010s). *Frontiers in Plant Science*, 12, [707852]. <https://doi.org/10.3389/fpls.2021.707852>

Fischer, E. K., Hauber, M. E., & Bell, A. M. (2021). Back to the basics? Transcriptomics offers integrative insights into the role of space, time and the environment for gene expression and behaviour. *Biology Letters*, 17(9), [20210293]. <https://doi.org/10.1098/rsbl.2021.0293>

Lawson, S. L., Enos, J. K., Wolf, C. S., Stenstrom, K., Winnicki, S. K., Benson, T. J., Hauber, M. E., & Gill, S. A. (2021). Referential alarm calling elicits future vigilance in a host of an avian brood parasite. *Biology Letters*, 17(9), [20210377]. <https://doi.org/10.1098/rsbl.2021.0377>

Song, X., & Cronan, J. E. (Accepted/In press). A conserved and seemingly redundant *Escherichia coli* biotin biosynthesis gene expressed only during anaerobic growth. *Molecular Microbiology*. <https://doi.org/10.1111/mmi.14826>

Saiki, H., Okano, Y., Yasuma, T., Toda, M., Takeshita, A., Abdel-Hamid, A. M., Fridman D'Alessandro, V., Tsuruga, T., D'Alessandro-Gabazza, C. N., Katayama, K., Sugimoto, M., Fujimoto, H., Yamanaka, K., Kobayashi, T., Cann, I., & Gabazza, E. C. (2021). A Microbiome-Derived Peptide Induces Apoptosis of Cells from Different Tissues. *Cells*, 10(11). <https://doi.org/10.3390/cells10112885> ■

I ILLINOIS

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