IGB NEWS

Upcoming Events

Monthly Profiles

Happenings at IGB

Image Of The Month

Research News

Department Announcements

Volume 14 Number 4

UPCOMING EVENTS

Chicago Council on Science & Technology Lecture Series

Bioinformatics: Understanding Our Genes

June 14, 2021, 4:00 p.m.

RSVP here

Saurabh Sinha
IGB Director of Computational Genomics
Founder Professor and Willett Faculty Scholar, Department of Computer Science
University of Illinois Urbana-Champaign

IGB DEI Seminar Series

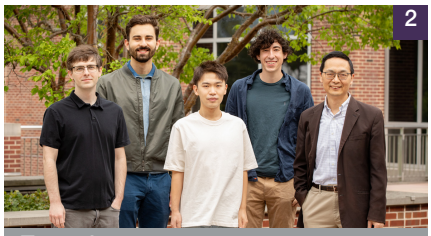
Barriers to Inclusion: Service Dog Handlers in Science Laboratories

August 24, 2021, 12:00 p.m.

Join via Zoom

Joey Ramp
CEO of Empower Ability Consulting
Neuroscience Research Affiliate, Beckman Institute, University of Illinois Urbana-Champaign

FEATURED NEWS



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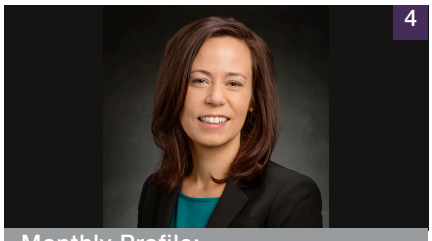
Team invents new COVID-19 test

3

Microsatellite markers for censusing endangered rhinoceros



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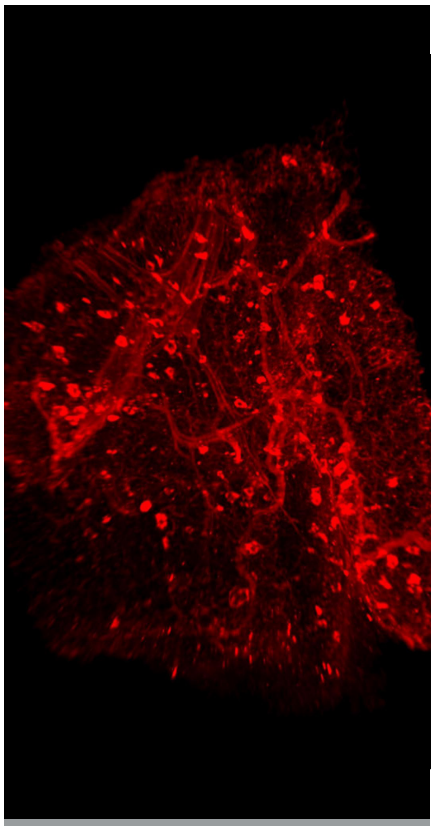
Monthly Profile: Pamela Martinez

5

On the Grid: Happenings at IGB

IMAGE OF THE MONTH

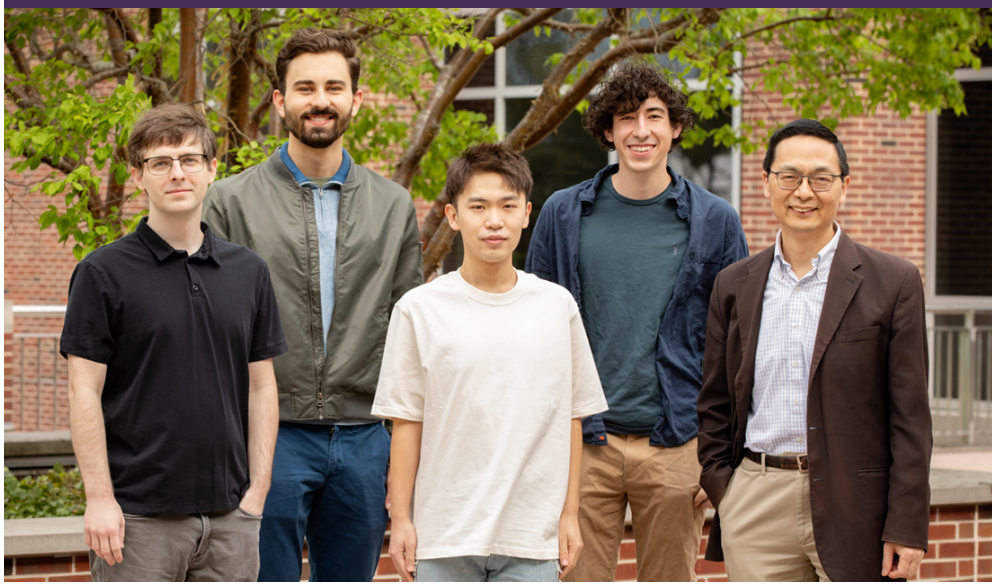


This month shows a 2D rendering of three-dimensional (3D) mouse adipose tissue cleared using the IDISCO clearing technique, and labeled with fluorescent dye against F4/80 protein (a macrophage marker). This fluorescent image was taken with the Ultramicroscope and rendered using the Imaris software at the Carl R. Woese Institute for Genomic Biology Core Facilities. Image courtesy of Arogundade Opeyemi Hamid of the Andrew Smith lab.

IGB News

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

FEATURE



Portable, affordable, accurate, fast:
Team invents new COVID-19 test

A new coronavirus test can get accurate results from a saliva sample in less than 30 minutes, researchers report in the journal *Nature Communications*. Many of the components of the hand-held device used in this technology can be 3D-printed, and the test can detect as little as one viral particle per 1-microliter drop of fluid.

"We developed a rapid, highly sensitive and accurate assay, and a portable, battery-powered device for COVID-19 testing that can be used anywhere at any time," said Illinois chemical and biomolecular engineering professor Huimin Zhao (BSD leader/CABBI/GSE/MMG), who led the research. Though it is still in the prototype stage, the device is estimated to cost less than $78 and the reagents and other materials needed for testing would amount to $6-$7 per test, the researchers found.

Current coronavirus testing technologies are complex, expensive, time-consuming and require bulky equipment and expert analysts, whereas the new device can be operated by anyone with minimal training who is careful when loading samples, Zhao said.

The innovation was made possible by the recent discovery in Zhao's laboratory of a system for making artificial restriction enzymes that can be programmed to recognize and cleave specific genes in an organism's genome. In the new device, these enzymes carry DNA guides that tag the viral genes of interest. The enzyme cleaves the genes, which have been tagged with a dye that fluoresces only after the genes are cut. The resulting fluorescence signals that those genes are present – a positive test result.

The new technology, called Scalable and Portable Testing (SPOT), does away with the complicated process of heating and cooling each sample to get results, as many current testing protocols require. SPOT also can detect multiple genes per sample, making it more accurate than single-gene tests, which can yield incorrect or inconclusive results. Another advantage is that it utilizes saliva, which is easier to collect and less invasive than a nasal swab.

Above: The research team included, from front left, Stephan Lane, manager of the Illinois Biological Foundry for Advanced Biomanufacturing; graduate student Guanhua (Daniel) Xun; Huimin Zhao, the Steven L. Miller Chair of chemical and biomolecular engineering, and a professor of chemistry, biochemistry, biophysics, and bioengineering. In back, from left, electrical and computer engineering undergraduate student Vassily Petrov; and mechanical science and engineering undergraduate student Brandon Pepa, who recently graduated.

The research team tested SPOT using 104 clinical saliva samples. They found that it accurately identified 28 out of 30 SARS-CoV-2-positive samples and 73 of 74 SARS-CoV-2-negative samples.

"Based on the data reported in the literature, the accuracy of our test is comparable to or better than other SARS-CoV-2 tests," Zhao said.

The researchers also tested SPOT with samples containing – or lacking – the influenza virus, the new coronavirus and three other human coronaviruses. It accurately identified samples containing the new coronavirus, whether or not other viruses were present in the sample.

"We are interested in exploring this technology for detection of other diseases as well," Zhao said. "One key advantage to this technology is its multiplexing capability, so in principle, we can detect many viruses simultaneously using the same device."

The SPOT system also may be useful for detecting genetic markers of certain types of cancer in saliva, he said.

Zhao also is a professor of bioengineering, of chemistry, and of biomedical and translational sciences in the Carle Illinois College of Medicine. The IGB, together with the Steven L. Miller Chair Endowment, supports this research. ■

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

Development of microsatellite markers
for censusing of endangered rhinoceros

Today, the Sumatran rhinoceros (Dicerorhinus sumatrensis) is critically endangered, with fewer than 100 individuals surviving in Indonesia on the islands of Sumatra and Borneo. To ensure survival of the threatened species, accurate censusing is necessary to determine the genetic diversity of remaining populations for conservation and management plans.

A new study reported in BMC Research Notes characterized 29 novel polymorphic microsatellite markers — repetitive DNA sequences — that serve as a reliable censusing method for wild Sumatran rhinos. The study was a collaborative effort involving the University of Illinois Urbana-Champaign, the Eijkman Institute for Molecular Biology in Indonesia, Queen's University in Canada, and the San Diego Zoo.

"It's hard to do population censusing for this species because there's not a ton of them and they're very elusive so it's hard to figure out how many there are," said Jessica Brandt, former PhD student in the Roca lab who led the study. "We were looking for ways to do that without handling the species. This was a joint effort between groups of people who were interested in working on these endangered species and contributing to their management."

Sumatran rhinos live in dense rainforests that are hard to traverse through, making it difficult to track Sumatran rhinoceros populations. The researchers relied on fecal DNA collected from Sumatran rhino dung samples, requiring little interaction with individuals in the wild. Although dung sampling poses many benefits, fecal DNA can be degraded and the age of the samples hard to determine. In order to overcome these challenges, researchers designed optimized microsatellite markers that were short and easy to amplify from dung samples.

"Microsatellite markers are found in non-coding regions and because of that, they evolve pretty quickly," said Brandt. "They're really useful in populations where you want to identify individuals because you're going to see more variation at those particular markers than if you're using a protein-coding gene."

"During replication of the DNA, these markers can very easily expand or contract like a genomic accordion" said Illinois animal sciences professor Alfred Roca (EIRH/GNDP). "By looking at enough of these markers, you can distinguish animals because microsatellites evolve very quickly and are highly variable within species. These markers are ideal to target regions of the rhino genome that are highly variable."

Using high quality DNA sequences from captive Sumatran rhinos, researchers identified 29 polymorphic candidate loci for further optimization. To test its utility for censusing, 13 of the 29 markers were randomly tested on fecal samples collected from wild Sumatran rhinos. The researchers were able to amplify nine of the markers from 11 wild fecal samples.

"The combination of these markers yielded better statistical power for identifying Sumatran rhino individuals and amplified very well when tested using non-invasive samples," said Sinta Saidah, co-author and research assistant at the Eijkman Institute for Molecular Biology in Indonesia. "We hope that we can use these markers on more samples collected in the field to provide island-wide population data for Sumatran rhinoceros species, which will help us devise better conservation strategies for this critically endangered species."

"To make a conservation plan, you have to know who's there and what their current level of diversity is," said Brandt. "Our markers would allow the Indonesian officials to determine not just how many rhinos they can count but whether or not they're related. Ultimately, another goal would be to expand this research to include other endangered rhinoceros species."

Other authors of the study include Kai Zhao, Isabella Apriyana, Oliver Ryder, Widodo Ramono, Herawati Sudoyo, Helena Suryadi, and Peter Van Coeverden de Groot.

Funding was provided by the US Fish and Wildlife Service Rhinoceros and Tiger Conservation Fund, the International Rhino Foundation, the Ministry of Research and Technology/National Research and Innovation Agency of the Republic of Indonesia, the World Wildlife Fund, the National Science and Engineering Research Council, and the Illinois ACES Office of International Programs. ■

Written by Alisa King-Klemperer .
Photo by Bertha Letizia .

MONTHLY PROFILE

Hannah Holscher is an Assistant Professor in the Department of Food Science and Human Nutrition. Using bioinformatics approaches, she studies the link between diet, gut microbes, and health.

Studying the gut microbiome
using big data approaches

Growing up in a small farming community in Palestine, Illinois, Hannah Holscher found that her favorite subject was science. "I had great biology and chemistry teachers, and when I was trying to decide my career path, I knew I was interested in health sciences," Holscher said. Although she was interested in health, Holscher knew that she did not want to be a medical doctor. She decided to pursue a food science and human nutrition degree at the University of Illinois in 2002. "It was the first time I encountered such big classrooms. I went from a town of 1300 people and a graduating class of 38 students to classes that sometimes had more than 1000 students. Still, it was nice to be fairly close to home," Holscher said.

Holscher started her undergraduate studies wanting to work as a registered dietitian. To do so, she completed a one-year dietetics internship after she graduated. "During the internship, I worked in hospitals and clinics with patients to help them make dietary changes to support their health. I had professional mentors who would oversee everything I did," Holscher said. Although she enjoyed her experience, it made her realize that she did not want to work as a dietitian. "As a part of my elective rotations, I worked in Kelly Tappenden's lab at the University of Illinois, and I realized how much I enjoyed the process of scientific exploration. I liked working at the bench and reading the scientific literature. At the end of the week, she told me she had a research assistant position open, and I agreed to join her lab," Holscher said.

During her graduate training, Holscher looked at the microbial and immunological effects of probiotics, which are live microorganisms that provide health benefits to the host, and prebiotics, which are compounds that induce the growth of beneficial gut organisms that support host health, in infants that were either breast-fed or formula-fed. Holscher also studied complex sugars in human milk —called oligosaccharides—using cell culture studies. "A great part of my doctoral training was that I was able to conduct clinical and *in vitro* research, as well as learn how to work with piglets, which we used to study short bowel syndrome since their intestinal tracts are very similar to humans," Holscher said. "I did different microbial and immunological assays."

For her post-doctoral training, Holscher wanted to dive deeper into studying the gut microbiome. Her decision on where to work became easier when she and her husband both received postdoctoral position offers at the University of Illinois. Holscher worked with Kelly Swanson, who focuses on the animal microbiome. "Since he was looking for someone with clinical expertise, I elected to work with him to do clinical trials on the effect of different fiber types on the human gut microbiome," Holscher said.

"During my postdoctoral training, I spent a lot of time focusing on how to program and do bioinformatics analyses. At the time, this type of work was a major research bottleneck because very few biologists or nutritional scientists were trained in computer science," Holscher said. "The programs had to handle large data sets, and I spent time learning how to analyze my data, which opened up several opportunities for new collaborations."

Holscher joined the University of Illinois as a faculty member in 2015. "Since I wanted to use big data to study the microbiome, diet, and nutrition, Illinois presented the best opportunity. Our sequencing centers are state-of-the-art, and we have an easily accessible supercomputer that is affordable," Holscher said. "Another aspect that tipped the scale was that I had the opportunity to recruit graduate students during my postdoctoral training who were able to start days after I began my faculty position."

The overall goal of the Holscher lab is to enhance human health through dietary modulation of the gastrointestinal microbiome. The lab uses both clinical and computational approaches to answer their research questions. "We focus on two different tracks: characterizing dietary impacts on the human microbiome and understanding the health effects of these host-microbe interactions," Holscher said. The first research question focuses on how specific foods or dietary patterns affect the microbiome. She and her team also use information from the microbiome and metabolomics data to predict food intake. "We've shown that bacteria can be used as biomarkers for food intake. We carried out feeding studies and showed that using just the microbes, we were able to predict which foods an individual had consumed. Overall, the predictions were 85% accurate," Holscher said.

"When I started as a faculty member, the impact of diet on the gut microbiome was underappreciated by the broader scientific community. It was a struggle to get the attention of microbiome scientists to include diet in their studies. Over the past five years of my career, we have made a lot of process in raising awareness about the importance of diet," Holscher said.

Holscher now hopes to combine her studies with Artificial Intelligence to personalize nutrition. "The University of Illinois has included personalized nutrition in its strategic plan through the Personalized Nutrition Initiative, and it aligns with the goals of the National Institutes of Health," Holscher said. "A group of us have put together a proposal to support a precision nutrition AI center and I'm excited about the innovative work we can do at Illinois to advance nutrition research using AI."

Like many other labs, the Holscher group also faced challenges during the pandemic. "Since we do clinical research, we had to immediately stop in-person testing. We had started a clinical study in January 2020 and had two other studies lined up in the spring and the summer, all of which have been delayed. Although our clinical research slowed down, my graduate students worked on their manuscripts, and most have sent something out the door," Holscher said.

"The pandemic has disproportionately affected junior faculty members, especially those that have young children at home. I have a two-and-a-half-year-old, and we didn't have childcare for six months. I worked during nap times, late at night, and early in the morning. Fortunately, the university did a great job with the testing, and we felt comfortable sending our child back to daycare at the beginning of September," Holscher said. "We also had to put in extra hours to move classes online, which cut into the research productivity. I recently got my second COVID-19 vaccine, and I am excited to spend more time in the lab because I miss the hallway conversations and having the students stick their heads in my office. Although it's been rough, they have been resilient, and I know that things will get better." ■

Written by Ananya Sen.
Photo courtesy of Hannah Holscher.

ON THE GRID
HAPPENINGS AT THE IGB

AWARDS

JOSEPH IRUDAYARAJ

Joseph Irudayaraj, Founder Professor of Bioengineering (CGD/EIRH) was selected as a Fellow of the Royal Society of Chemistry, recognizing his experience, expertise and commitment to promoting the value of interdisciplinary research at the chemistry-engineering interface.

RUBY MENDENHALL

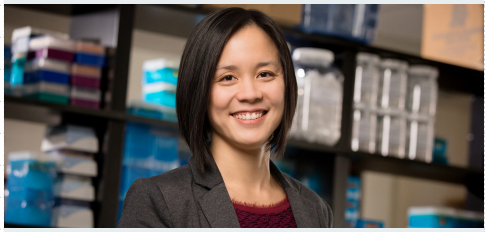
Ruby Mendenhall, Associate Professor of Sociology (GNDP) was named in the Outstanding Faculty and Staff category of the 9th Annual Diversity and Social Justice Education Awards presented by the UIUC Office of Inclusion and Intercultural Relations, recognizing her efforts to address marginalization, oppression, and privilege in our community.

GENE ROBINSON

Gene Robinson, Swanlund Chair, Professor of Entomology (Director/GNDP) was elected a Member of the American Philosophical Society, the oldest learned society in the United States, founded in 1743 by Benjamin Franklin for the purpose of "promoting useful knowledge."

WILFRED VAN DER DONK

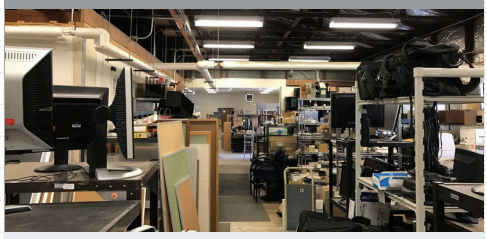
Wilfred van der Donk, Richard E. Heckert Endowed Chair in Chemistry (MMG), was elected to the National Academy of Sciences, one of the highest professional honors a scientist can receive.



WENDY YANG

Wendy Yang, Associate Professor of Plant Biology (CABBI/GEGC), received the College of Liberal Arts & Sciences Dean's Award for Excellence in Undergraduate Teaching for outstanding contributions to the college in teaching.

EQUIPMENT



CAMPUS SURPLUS

Before obtaining computer items from campus surplus, please check with the CNRG at help@igb.illinois.edu. CNRG often has equipment to distribute or can provide recommendations about new purchases.

Assets at campus surplus, especially IT equipment, may have problems or issues - likely the reason the asset was sent to the campus warehouse in the first place.

PLAYBOOK

K-12 SHIELD PLAYBOOK OFFERS GUIDANCE FOR REOPENING SCHOOLS

A new resource is available to help guide teachers and school administrators as they reopen schools amid the ongoing COVID-19 pandemic, assembled by researchers and experts at the University of Illinois Urbana-Champaign.

The K-12 Shield Playbook is based on the SHIELD Illinois program used to mitigate the COVID-19 pandemic at the university. The multidimensional "Target, Test, Tell" approach resulted in a fall 2020 semester with zero COVID-19-related hospitalizations or deaths in the university community, positivity rates generally maintained below 0.5% and minimal transmission from the campus to the surrounding Champaign-Urbana community.

"We are sharing what we've learned, so other schools who want to add this can learn from our experience," said study leader Rebecca L. Smith (IGOH), an Illinois professor of pathobiology. "The K-12 Playbook provides all of the resources that a school would need in one place. There are a lot of resources out there, but they're scattered. We brought it all together as a resource repository for schools, with a guide to making all the decisions necessary to reopen a K-12 school."

"We've seen this program work at Illinois, and now we need to make it as accessible as possible to other universities, K-12 schools and communities throughout the U.S. and the world to help build a bridge to widespread global vaccination," said Dr. Martin D. Burke (MMG), the associate dean for research at the Carle Illinois College of Medicine and a professor of chemistry.

"There is great cause for optimism that the COVID-19 vaccines will ultimately get us out of this extraordinarily challenging situation. But this is not going to happen overnight. It will take more time than any of us would like, and until widespread immunity has been achieved, we cannot let our guard down. This is why the Shield Playbook is so important," Burke said.

ON THE GRID
HAPPENINGS AT THE IGB

STEAM

STUDENTS COMPLETE THEIR FIRST STEAM TRAIN JOURNEY

Starting from September 2020, six groups of 38 students from Franklin STEAM Academy in Champaign met every Tuesday afternoon after school to conduct research on important topics. The project, called "STEAM TRAIN", involved the 6th-8th grade students, researchers from the Carl R. Woese Institute for Genomic Biology, and a dozen students from University Laboratory High School, or Uni High. The projects concluded in May 2021.

The STEAM (Science, Technology, Engineering, Arts, and Mathematics) TRAIN (Transdisciplinary Research Across Institutional Near-peers) project was selected for stage 1 funding by the University of Illinois' Community Research Partnership Program (CO+RE).

The program was organized by the IGB's Outreach Senior Activities Coordinator Daniel Urban, Franklin's Magnet Site Coordinator Zanne Newman, and Uni High's chemistry teacher David Bergandine. Their main objective was to inspire autonomous, curiosity-driven student research through interactions with near-peer mentors. They hoped that the Franklin students would discover their love for science by exploring difficult issues that they're passionate about.

The Uni High students were recruited to serve as a bridge since students may feel more comfortable forming connections with mentors who are closer to them in age. The idea was to create a chain of people who were closer in age so that there was a level of comfort among all the participants.

The final student presentations were carried out online and each group explained the inspiration behind their project, their research methods, what they found out, and how they plan on continuing the project, hopefully in-person, next year. "Throughout the year, the persistence and creativity of the students continued to astound us. As much as we hope the program benefited them, these kids served as a source of inspiration for us as well," Urban said.

DEI

DIVERSITY, EQUITY, AND INCLUSION EFFORTS UNDERWAY AT THE IGB

The Carl R. Woese Institute for Genomic Biology (IGB) values equality and respect for every member of its community. Investigators, students and staff from diverse backgrounds bring their lived experiences and unique perspectives together. This diversity improves the IGB's ability to solve problems and be responsive to societal needs. Since its inception in 2018, the IGB Committee on Diversity (COD) has been dedicated to creating a more inclusive, diverse and welcoming environment within the IGB community. The COD is comprised of IGB community members spanning the breadth of IGB, including theme leaders, faculty, staff and postdoctoral researchers. Current IGB COD members are Professor of Anthropology Ripan Malhi (GNDP/GSP/IGOH), Professor of Sociology Ruby Mendenhall (GNDP), Professor of Integrative Biology Carla Cáceres (IGOH), Professor of Plant Biology Katy Heath (IGOH), Professor of Food Science & Human Nutrition Zeynep Madak-Erdogan (CGD/EIRH/GSP), postdoctoral researcher Steven Burgess (GEGC), Professor of Microbiology Gary Olsen (BCXT), science writer Alisa King-Klemperer and Professor of Chemical and Biomolecular Engineering Hyunjoon Kong (M-CELS leader/EIRH/RBTE).

Spurred by recent events, the COD Task Force was formed to gather more individuals to take action on the COD's ideas and bring new initiatives to light. Under the guidance of the COD, the COD Task Force has accelerated initiatives meant to increase dialogue and create change internally in working towards a more inclusive environment. The IGB now has a dedicated webspace for diversity, equity and inclusion (DEI) that houses DEI event information, resources, and current partnerships. Although many efforts are underway, the IGB realizes more work needs to be done to diminish racism, other inequities and where they intersect.

Read the full range of DEI efforts, events, and program here.

AMAZON

amazon BUSINESS

AMAZON BUSINESS ACCOUNTS

The U of I System recently issued the following information concerning Amazon for Business Account Holders:

Please be advised that your purchasing offices are continuing to consider options to obtain state authority approval for continued use of the university's Amazon for Business (AFB) account. Amazon has to date been unable to provide the documentation necessary to secure such approval and it has been decided to postpone the planned shutdown of the AFB account for a second time. The AFB account will not shut down on April 30, 2021, as previously communicated.

However, if the university is unable to obtain state authority for continued use of the AFB account, the AFB account will shut down on June 15, 2021. If a shutdown becomes necessary, a communication will be sent to AFB account holders prior to the shutdown.

Please note that the shutdown of the AFB account does not affect purchases for Amazon Web Services (cloud services) nor the Amazon eCode/Mechanical Turk program (for payments to human subjects). Amazon Web Services are contracted through a competitive request for proposal and has the underlying state authority for its use while the Amazon eCode program is being reviewed for compliance with state authority.

If you have questions regarding this delay, please contact your purchasing office: https://www.obfs.uillinois.edu/purchases/

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.

Zwilling, C. E., Strang, A., Anderson, E., Jurcsisn, J., Johnson, E., Das, T., Kuchan, M. J., & Barbey, A. K. (2021). Author Correction: Enhanced physical and cognitive performance in active duty Airmen: evidence from a randomized multimodal physical fitness and nutritional intervention (*Scientific Reports*, (2020), 10, 1, (17826), 10.1038/s41598-020-74140-7). *Scientific reports*, 11(1), [3820]. https://doi.org/10.1038/s41598-021-81800-9

Fatima, M., Ma, X., Zhou, P., Zaynab, M., & Ming, R. (2021). Auxin regulated metabolic changes underlying sepal retention and development after pollination in spinach. *BMC Plant Biology*, 21(1), [166]. https://doi.org/10.1186/s12870-021-02944-4

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Enghiad, B., Huang, C., Guo, F., Jiang, G., Wang, B., Tabatabaei, S. K., Martin, T. A., & Zhao, H. (2021). Cas12a-assisted precise targeted cloning using *in vivo* Cre-lox recombination. *Nature communications*, 12(1), [1171]. https://doi.org/10.1038/s41467-021-21275-4

Brandt, J. R., Saidah, S. H., Zhao, K., Ishida, Y., Apriyana, I., Ryder, O. A., Ramono, W., Sudoyo, H., Suryadi, H., Van Coeverden de Groot, P. J., & Roca, A. L. (2021). Characterization of 29 polymorphic microsatellite markers developed by genomic screening of Sumatran rhinoceros (*Dicerorhinus sumatrensis*). *BMC Research Notes*, 14(1), [119]. https://doi.org/10.1186/s13104-021-05522-x

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Woźniak, M., Konopka, C. J., Płoska, A., Hedhli, J., Siekierzycka, A., Banach, M., Bartoszewski, R., Dobrucki, L. W., Kalinowski, L., & Dobrucki, I. T. (2021). Molecularly targeted nanoparticles: an emerging tool for evaluation of expression of the receptor for advanced glycation end products in a murine model of peripheral artery disease. *Cellular and Molecular Biology Letters*, 26(1), [10]. https://doi.org/10.1186/s11658-021-00253-0

Zhang, C., El-Kebir, M., & Ochoa, I. (2021). Moss enables high sensitivity single-nucleotide variant calling from multiple bulk DNA tumor samples. *Nature communications*, 12(1), [2204]. https://doi.org/10.1038/s41467-021-22466-9

McEwen, G. K., Alquezar-Planas, D. E., Dayaram, A., Gillett, A., Tarlinton, R., Mongan, N., Chappell, K. J., Henning, J., Tan, M., Timms, P., Young, P. R., Roca, A. L., & Greenwood, A. D. (2021). Retroviral integrations contribute to elevated host cancer rates during germline invasion. *Nature communications*, 12(1), [1316]. https://doi.org/10.1038/s41467-021-21612-7

Wang, Y., Zhang, Y., Zhang, R., van Schaik, T., Zhang, L., Sasaki, T., Peric-Hupkes, D., Chen, Y., Gilbert, D. M., van Steensel, B., Belmont, A. S., & Ma, J. (2021). SPIN reveals genome-wide landscape of nuclear compartmentalization. *Genome biology*, 22(1), [36]. https://doi.org/10.1186/s13059-020-02253-3

Juma, E. O., Allan, B. F., Kim, C. H., Stone, C., Dunlap, C., & Muturi, E. (2021). The larval environment strongly influences the bacterial communities of *Aedes triseriatus* and *Aedes japonicus* (Diptera: Culicidae). *Scientific reports*, 11(1), [7910]. https://doi.org/10.1038/s41598-021-87017-0

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