

IGB Outreach

**Annual
Report**

**20
19**

“The art and science
of asking questions
is the source of
all knowledge.”

—*Thomas Berger*



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IGB Outreach Annual Report 2019

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Letter from the Manager



Courtney Fenlon
Senior Outreach
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Nature brings wonder and magic to our lives as we strive to explore the mysterious and interpret the world around us. Something that defines us as humans is our curiosity and our ability to ask questions and continue to learn throughout our lifetime. Both art and science are disciplines that fulfill this desire to acquire knowledge, while also providing a platform to share information about our quest. Art and science both evoke a variety of emotions as we grapple with the information they reveal and represent. With art, no matter the form, the audience members are empowered to make their own interpretations. It's this act of interpretation that elicits a response; the beholder has room to engage and ask questions about the universe and individual perspectives of the world. In my opinion, successful art, just like science, should leave the examiner asking more questions.

A successful scientist never stops asking questions. Answering one question only leads to another, as they dive deeper into the phenomena and mysteries around them. What brings art and science together is the importance of asking good questions, a skill that is fostered in both disciplines and is a universal human behavior. If as a community we ask good questions, we can begin to challenge and examine our understanding of the natural world, leading us to reshape our approach to some of life's greatest challenges.

An excellent example of the IGB combining art and science to elicit curiosity is our new Ask a Scientist Zine event this year. During a field trip to the IGB, students from Champaign's Unit 4 Franklin STEAM Academy were tasked with creating a zine with questions for scientists at the IGB. With over 250 zines created, IGB scientists answered questions ranging from "what would my DNA show" to "how do scientists think of scientific names for animals" to "why did you want to be a scientist?" This simple activity embodied fully the IGB outreach mission to foster education and conversation. Students, who instinctively want to explore, learned how to ask a good question, an important skill to foster in new scientists. IGB scientists learned how to critically think about and discuss the science questions that we all feel fascinated by. Together, they brought a true spirit of science and discovery into the IGB.

Last April, IGB was able to expand its Art of Science program to host a reception at the U.S. Capitol, in conjunction with our Washington D.C. visit for the event DecisionTown in the World of Genomics. The exhibit featured images that originated from IGB research supported by national funding sources. In a time when humans are facing monumental questions, this event brought scientists and policy makers together to encourage conversation and discussions around some of the world's more pressing questions and concerns.

Other outreach stories from the IGB include hosting thirty journalists for a Genomics For™ Workshop, hosting the Summer Internship for Indigenous Peoples in Genomics at the IGB, and continuing both our Game Day Genomics event at home football games and the postdoctoral training program, Professional Skills for Careers in Biosciences.

These outreach events and the many others highlighted in this report reflect the engaging and intricate questions the scientists at the IGB ask on a daily basis. With outreach events, the IGB strives to make science accessible and to create a conversation around science. With its tagline "where science meets society," the IGB Science Outreach Program has become a platform to ask more questions. It opens science at the IGB to a broader audience to foster a conversation, share discoveries, discuss differing interpretations, and ask new probing life-altering questions.



By the Numbers

Carl R. Woese Institute for Genomic Biology 2019 Outreach by the Numbers

7,000

People reached

1,400

Volunteer hours

225

Hours of outreach events

230

Volunteers

87

Days of outreach events

75

Outreach events

9

Community connections

7

Campus partnerships

17

Locations

6

Cities

3

States

4 - 73+

Ages of participants

Kleinmuntz Center

This year, we had the launch of the Catherine and Don Kleinmuntz Center for Genomics in Business and Society. Announced this February, the center is providing the resources that genomic innovations need to branch out into everyday applications. It is serving as a platform for enhancing and accelerating the broader impacts of the IGB's research and innovation by building on the IGB's innovative genomics research and outreach portfolio. The center is a part of the IGB and is providing unique opportunities for economic development, public engagement and social impact.

Drs. Catherine and Don Kleinmuntz are the co-founders of Strata Decision Technology, a healthcare analytics software company that was an early tenant of the University of Illinois Research Park. They were introduced to the IGB when Catherine Kleinmuntz was invited to visit as a distinguished guest speaker. During her talk she shared her expertise and experience in entrepreneurship and start-up businesses, which inspired the idea behind the Catherine and Don Kleinmuntz Center for Genomics in Business and Society.

Within its first year, the Kleinmuntzes generous donation has provided researchers with proof-of-concept and pre-commercialization support that will help them bring technologies and innovations to market. In addition, the Kleinmuntz Center helped broaden the Genomics For™ program, which teaches basic concepts in genomics to specific demographic or professional groups, helping them understand the full impact of genomics both in their professions and in society. This year, the program hosted a workshop for journalists in collaboration with SciLine.

The Center also provided funding for initiatives at the IGB to reach young students, especially those in underserved and underrepresented communities. This year, the center funded DecisionTown in the World of Genomics at the National Academy of Sciences, delivering an event that continues to bring genomics to the public through hands-on exhibitions to broad audiences across the country.

The Kleinmuntz Center has brought together economic development and societal advancement, proving that genomic research has the ability to make a difference in all areas of life.



DecisionTown in the World of Genomics

The IGB partnered with the National Academies of Sciences, Engineering, and Medicine (NASEM) to present Family Science Day at the NAS Building: DecisionTown in the World of Genomics. This event combined our largest outreach event, World of Genomics with NASEM's engaging DecisionTown interactive public experience. DecisionTown in the World of Genomics invited family visitors to see how decisions they make every day are influenced by science, engineering, medicine and genomics.

It was NASEM's debut open house event to the public, and thousands of Washington D.C. families and visitors came through the building to experience the IGB's diverse and exciting research portfolio. There were 17 activity stops in total, with IGB featuring its six World of Genomics interactive stations with a team of Illinois research volunteers from dozens of scientific fields. Participants interacted with fun, creative and engaging hands-on activities including a health-themed food court and a medical center where participants could learn about DNA sequencing and personalized health.

At IGB's Tree of Life station, participants learned about the third domain of life, discovered by Illinois researcher and IGB namesake Carl Woese. They could also watch real-time sequencing of a microbial genome on an iSeq provided by our collaborators, Illumina.

As at past events, we had the Brains and Behavior station where participants viewed a live beehive and used virtual reality goggles to explore life as a bee. Our DNA to Drugs station showcased antibiotics in action and robotic devices helping researchers to identify new drug compounds.

The Emergence of Life station explored how life began and examined the types of interactions between microbes, the environment and humans. Visitors at the Food and Fuel station observed how a combination of traditional breeding, genetic engineering and genome editing can create plants with higher yields that withstand drought and disease.

Guests also visited the Personalized Health station where they saw a 3D printer in action and could explore the interactions between microbes and the environment while playing the game Last Microbe Standing.



Engaging The Community

IGB hosts a variety of outreach events that connect IGB research and researchers to society. These large-scale events are open to the public, intending to increase awareness and understanding of genomics in everyday life, and to empower communities to use this knowledge to shape their lives.

At a Glance

Art of Science at Capitol Hill:

An Art of Science exhibit at the Rayburn Building on Capitol Hill. The exhibit showcased art created from federally-funded research.

Basketball Field Trip with the Division of Intercollegiate Athletics:

Hundreds of students visited to pollinate a giant flower and make flower models at the Division of Intercollegiate Athletics' basketball field trip event.

Distinguished Lecture:

This year distinguished researcher Leslie Voshall presented on mosquitos neurobiology and behavior.

★ Game Day Genomics:

A collaboration with the Division of Intercollegiate Athletics, IGB brought hands-on genomics activities to the family fun zone at Illinois home football games.

★ Genome Day:

IGB scientists brought hands-on activities featuring IGB research for a family open house event at a new location, Franklin STEAM Academy in Champaign.

Science Café:

Public lectures and discussions with scientists from IGB and the Beckman Institute at Urbana's Cafeteria and Company.

Trick or Treat with the Stars:

A pumpkin murder mystery activity for children visiting the Division of Intercollegiate Athletics' trick-or-treat with the (basketball) stars event.

★ *feature story — for more detail turn the page*



★ Game Day Genomics

In collaboration with the Division of Intercollegiate Athletics (DIA), the IGB hosted a genomics tailgate booth for Game Day Genomics at all home Illinois Football games, representing a unique blend of science and football. The Game Day Genomics booth was located in the Grange Grove kid's zone, which included live music and entertainment, a family zone, student tailgates, corporate hospitality, the Fighting Illini Team Walk, the Marching Illini pregame show, and Gameday Spirit merchandise locations.

Game Day Genomics offered an opportunity for the community to engage in fun and stimulating scientific activities, ranging from DNA extraction of strawberries to flower pollination games. Visitors learned about different products that can be produced in yeast and plants. They also helped the Illini football quarterback "escape" from the locker room by solving DNA-themed puzzles.

In addition, visitors to Game Day Genomics participated in recurring activities such as a DNA-themed bean bag toss and taking "cell-fies" with scientific props at the photo booth. Last year, over 600 children and families visited the Game Day Genomics booth during the home football games, bringing together Fighting Illini fans of all ages.



Families participate in flower pollination activities at Game Day Genomics



Families participate in a DNA-themed bag toss at Game Day Genomics

★ Genome Day

Genome Day is a free open-house event for community members of all ages to learn about genomes, genes, DNA, and evolution. We had over 250 attendees at this family-friendly science event. This year, we hosted Genome Day at a new location, Franklin STEAM Academy in Champaign. Franklin STEAM Academy and IGB formed a partnership in 2018 to create opportunities for both organizations.

Genome Day features hands-on, child-friendly activities related to genomics. The activities span multiple science disciplines including health, agricultures, microbes, energy, evolution and more. This year, activities included the game Last Microbe Standing, an elimination-style board game that explored microbial populations and their relationships with the environment. It also featured the activity Dancing with Plants, in which student and families learned about plant growth and could engage with plant videos using a green screen.

Returning this year, participants could extract DNA from strawberries to make necklaces, create models of DNA out of candy, and crack the (genetic) code of life. For several years, volunteers from SACNAS (Society for Advancement of Chicanos and Native Americans in Science) have provided language assistance for Spanish-speaking attendees.



Exploring the structure of DNA



Taking a closer look at an animal skeleton

Cultivating the Future

The IGB is committed to outreach events for students. A variety of educational events for children in kindergarten through high school are hosted in order to introduce students to genomics, DNA, and evolution. These events also showcase roles in science and genomics research as achievable potential careers.

At a Glance

★ **AP Chemistry Field Trip**

High school students from Danville High School visited chemistry labs at Illinois, learned about NMR and met with undergraduate and graduate students to ask questions about secondary education.

Campus Middle School Field Trip:

A visit that allowed students to see growing archaea, view samples under a microscope, and learn about protein translation.

DREAM Tour:

Students from the school-to-college pipeline program Driven to Reach Excellence and Academic Achievements for Males (DREAM) toured the IGB labs.

★ **Franklin 6th Grade Field Trip:**

The 6th grade class from Franklin STEAM Academy visited IGB, toured the lab and learned about the diversity of organisms by studying Winogradsky columns. Students also created zines to ask scientists questions that were answered by scientists at the IGB.

Mahomet Science Club:

Students extracted DNA in a fruit forensics activity at an afterschool science club for Mahomet Junior High.

Pollen Power Camp:

A weeklong summer camp focused on middle school girls to learn about plant biology, climate change, crop sciences, and entomology.

★ *feature story — for more detail turn the page*



★ AP Chemistry Field Trip

This May, students from Danville High School's Advanced Placement (AP) chemistry class made the trek to the University of Illinois campus to tour chemistry research facilities and talk with current graduate students about training and careers in science. The students visited the IGB as well as Illinois' Roger Adams Laboratory.

The group of thirty-three students, their instructor, and chaperones toured the laboratories of IGB members, viewing facilities dedicated to chemical biology, analytical chemistry, and microbiology research. Scientists at Roger Adams Laboratory showcased their nuclear Magnetic Resonance (NMR) laboratory. Students toured through IGB lab spaces and met with researchers. IGB Core Facilities staff showed off the IGB's suite of state-of-the-art microscopes. Students also saw the capabilities of the Biosystem Design research theme's iBioFAB robot with a hands-on robot demonstration.

The visitors wrapped up their day on campus with a question and answer session moderated by a panel of undergraduate, graduate, and postdoctoral researchers at the IGB. Students asked questions about the panel members' experiences in chemistry research. Students also shared their experience and asked questions about their visit.

This was Danville High School's second visit to the IGB for their AP chemistry class. It is a wonderful opportunity for high school students to learn about college at the University of Illinois as well as graduate research programs in chemistry.



Core Facilities Director Glenn Fried explains a microscopy technique to visiting students



Students tour a chemistry-based research laboratory

★ Franklin 6th Grade Field Trip

Over the course of two days, the IGB hosted a record-breaking field trip group of 270 6th grade students, offering hands-on investigations, tours, and creative activities. Students from Franklin STEAM Academy in Champaign visited the IGB, as part of a campus visit. The visit was part of a community partnership formed between Franklin STEAM Academy and IGB in October 2018. This partnership creates opportunities for both organizations by bridging the gap between the University and the Champaign community.

Visiting students viewed the capabilities of the Biosystem Design research theme's iBioFAB robot and heard a short presentation by Center for Advanced Bioenergy and Bioproducts Innovation scientists on sustainable fuel production and the industrial possibilities of custom microbes and microbiomes. In the IGB's teaching wet lab, they observed and described insects and microbes in freshly sampled pond water. Students also designed their own "Ask a Scientist" mini-zine, in which they posed and illustrated one or more questions directed at IGB researchers. IGB members later shared written answers at Genome Day, which was hosted this year by Franklin STEAM Academy.

Franklin STEAM Academy is a magnet middle school and is attended by a diverse population of over 600 students. They emphasize science, technology, engineering, art, and math (STEAM) curricula, and engage students through a variety of programming to help prepare them for high school and college. We plan to continue this collaboration and participate in additional activities to enrich student learning at Franklin STEAM Academy.



Students work together in the teaching wet lab



The iBioFAB robot was a highlight of the IGB tour

Educating Professionals

The IGB offers a variety of workshops and training programs for professionals to expand their genomics knowledge with a profession-specific curriculum so that they are armed with tools to interpret genomics research data in their workplace. The rapid pace of progress in genomics means that the gap between current knowledge and the science that most adults learned in high school or college courses is continually increasing. Continuing education courses such as the IGB's Genomics For™ programs provide an opportunity to close that gap.

At a Glance

★ **Fisk Collaboration:**

A bioinformatics research student training collaboration between Fisk University, a minority-serving institution in Nashville, Tennessee, and the University of Illinois as part of a campus-wide initiative to increase diversity.

Forensic Genomics for Investigators:

A program developed by IGB member Dr. Cris Hughes, in partnership with the Santa Cruz County Sheriff's Office and the Science and Justice Center for Research at UC Santa Cruz, to provide continuing education in genomics for all law enforcements in California.

★ **Genomics for Journalists:**

A three-day workshop with SciLine, a service hosted by the American Association for the Advancement of Science (AAAS) for U.S. journalists regarding genomics and science journalism.

Pathways Program:

A forensic genetic course offered to both University of Illinois and Parkland Pathways students in Spring 2019.

Summer Internship for Indigenous Peoples in Genomics:

A workshop for Indigenous Peoples around the world to meet and explore genomics and the benefits of genomics for their communities.



★ Fisk Collaboration

As part of a campus-wide initiative to increase diversity, a collaboration with Fisk University was approved for an additional five years of continued financial support from the Office of Executive Associate Chancellor for Administration and University Relations and the Office of the Vice Chancellor for Research and Innovation.

The five-year contribution will be matched through cost-share by the IGB and the Department of Physics, which will provide administrative and technological support for the students. The Grainger College of Engineering will also contribute funds, and its new “Institute for Inclusion, Diversity, Equity, and Access” will help establish research collaborations between Illinois and Fisk faculty.

The program, overseen by Professor of Physics Jun Song, invites students from Fisk University, a minority-serving institution in Nashville, Tennessee, to participate in hands-on bioinformatic analysis and biophysics training. In addition, the Carver Biotechnology Center’s High-Performance Biological Computing group (HPCBio) will provide personalized training resources and consulting.

This program encompasses two consecutive summer training programs, during which students become acclimated to the campus and research environment. In the first year, student’s extern with HPCBio at IGB where they provide hands-on training utilizing a high-performance computing cluster and performing statistical analyses of genomic data. Returning in the second year, students choose a faculty member to conduct research with at either the University of Illinois’ Summer Research Opportunity Program or Mayo Clinic’s Summer Undergraduate Research Fellowship.

Since 2016, eight students have participated in the Fisk program, including one student who conducted research at Mayo Clinic, and two students who conducted research at Illinois’ SROP. The majority of those students are now pursuing a degree in higher education or applying to medical school.



Skye Fauchner



Jaia Holleman

★ Genomics for Journalists

The IGB had the unique opportunity to work with SciLine, a service hosted by the American Association for the Advancement of Science (AAAS), to offer a Genomics For™ Journalists workshop. The workshop was designed for thirty working reporters to cover the basic science of genomics and explore advances in a field that is changing the way diseases are diagnosed and treated, novel crop varieties are developed, forensic evidence is interpreted, and new materials and fuels are being produced. The course was funded by SciLine’s philanthropic grants, which covered the full cost of travel and programming for the participants.

The three-day workshop capitalized on the IGB’s depth and expertise on basic genomics research and the impact of genomics on society. Journalists were immersed in faculty presentations, panel discussions, networking opportunities, as well as a laboratory session in which the journalists manipulated bacterial DNA using CRISPR.

Journalists learned about the use of genomics in genealogy and criminal justice, and gene editing in both agriculture and medicine. Researchers from the IGB also gave lectures on the effect of diet on the microbiome as well as the ethical and social issues raised by genomic advances. Journalists learned how to read and interpret scientific journal articles in a hands-on working session.

This workshop showcased the power of genomics and the implications it has for many careers and has prompted plans to expand the genomics education platform to additional professions.



Journalists engaged in a hands-on laboratory activity



Participants manipulated bacterial DNA using CRISPR technology

Developing Ourselves

Scientists can make a much larger impact with their science in society if they can constructively engage and communicate with the public. IGB outreach provides professional development courses, workshops, and events to prepare and equip scientists with the necessary skills for research and communications.

At a Glance

Alan Alda Science Communications Training:

Scientists participated in an Alan Alda Science communications training program before leading hands-on activities at the event DecisionTown in the World of Genomics.

★ **Fox Family Innovation & Entrepreneurship Lecture Series:**

A lecture series, kindly funded by Peter and Kim Fox, to provide IGB researchers exposure to innovation and entrepreneurship resources.

IGB Postdoc Association:

An association for IGB postdocs to engage with one another and participate in workshops for professional growth.

★ **IGB Undergraduate Association:**

A new association this year, this group engages with undergraduate researchers from the IGB and students interested in science research to provide professional development and volunteer opportunities.

International Genetically Engineered Machine (iGEM):

An international team competition made up predominantly of undergraduate students interested in the field of synthetic biology.

Professional Skills for Careers in Biosciences (PSCB):

A new program created to provide IGB graduate students and postdocs the opportunity to develop and enhance job skills.

★ *feature story—for more detail turn the page*



★ Fox Family Innovation & Entrepreneurship Lecture Series

Currently, academic and business leaders agree that science, technology, and business are no longer separate entities but require each other to thrive. As a result, the IGB has provided resources, networking, and exposure to post doctoral associates, students, and faculty for them to become successful innovators and entrepreneurs. The Fox family and the IGB have partnered to bring a series of speakers with varying expertise to discuss all aspects of innovation and entrepreneurship. This lecture series is generously supported by Peter Fox, Founder and Chairman of Fox Development Corporation in Champaign, and his wife Kim Fox.

The Fox Family Innovation and Entrepreneurship Lecture series introduced scientists to intellectual property, business fundamentals, venture funding, and the Illinois entrepreneurial ecosystem. Past speakers have included members from the Office of Technology Management and the Technology Entrepreneur Center on campus, and external speakers from the public and private industry.

This fall we hosted Kevin White from Tempus Labs to discuss computation genomics to treat cancer along with Larry Gold from SomaLogic, who presented on a start-up company built around broad proteomics.

In the spring we hosted Robert Altman, Entrepreneur-In-Residence at the Polsky Center for Entrepreneurship and Innovation, who presented on the great combination of science and entrepreneurship.



Professor Harold Craighead presenting a Fox Family Lecture



Kevin White Presenting

★ IGB Undergraduate Association

IGB Undergrad Researchers: Seeds of Science, Technology, Engineering, and Mathematics (STEM) is an organization that aims to connect undergraduate researchers on campus. Formed in 2019, Seeds of STEM provides an opportunity for undergraduate students to get involved in research by exposing Seeds of STEM members to research conducted by faculty at the IGB. Undergraduates were given various opportunities to build professional connections through volunteer, network, and outreach activities.

Seeds of STEM was started with undergraduate researchers at the IGB in collaboration with the IGB to provide professional development opportunities to all undergraduates partaking or interested in research on campus. Seeds of STEM members participated as panelists in the Danville High School Advanced Placement field trip at the IGB. They also presented their research to their peers during meetings.

Members meet once a month at the IGB during the semester and they are currently planning events for the Fall 2020 semester to include activities such as presentations from IGB graduate students and postdocs, professional skills workshops on applying to graduate or medical school, and research skill workshops on oral presentations or creating research posters.

Through these activities, undergraduates interested in research will be provided with opportunities to get involved in research and will provide networking opportunities to build professional connections.



Seeds of Stem Group



Getting Involved

Social Media



[@igbillinois](https://www.instagram.com/igbillinois)



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