

# IGS

INSTITUTE FOR GENOME SCIENCES

## Insider

Summer 2023

### Director's Corner

New Painting Highlights IGS Core in HSFIII Building Entrance

IGS Initiates Organizational Changes to Excel in Today's Competitive Landscape

IGS Founding Director Claire Fraser Elected to NAS; Becomes UMB Distinguished Professor; Receives Award from New York Academy of Medicine

Maryland Genomics Memos

Three Cheers

Under the Microscope

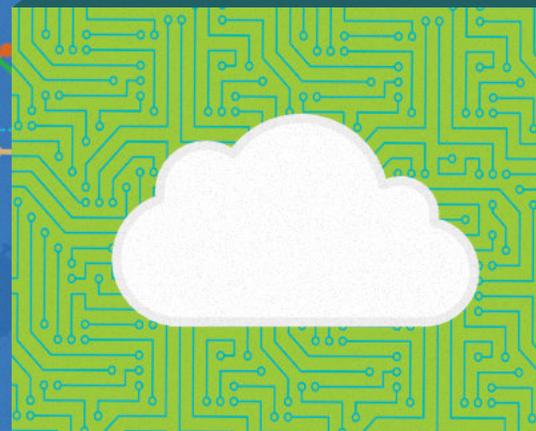
Claire Fraser and Ronna Hertzano Featured in New Book on Women in STEM

New Affiliate Faculty

Save the Date

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UNIVERSITY of MARYLAND  
SCHOOL OF MEDICINE  
INSTITUTE FOR GENOME SCIENCES

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## DIRECTOR'S CORNER

Dear All:

It's summer. A time for fun in the sun, campfires, and fireflies. At IGS, we have much to celebrate!

Our Founding Director Claire Fraser was elected to the esteemed National Academy of Sciences, as well as being named a Distinguished Professor at the University of Maryland, Baltimore (UMB) and receiving The New York Academy of Medicine's Medal for Distinguished Contributions to Biomedical Science ([page 5](#)). In another first, one of our own MD/PhD students Maddy Alizadeh received the University System of Maryland's (USM) highest award for a student: USM Regents Student Excellence in Academics, Scholarships, and Research—the only UMB student to win it ([page 12](#)). We're also celebrating Mike Humphrys of Maryland Genomics who has been recognized for his work during the Covid-19 Pandemic with the prestigious Board of Regents Staff Award for "Exceptional Contribution to the Institution and/or Unit to Which a Person Belongs ([page 11](#)).” In addition, we have promotions, service awards, and other recognitions to applaud ([page 13](#)).

Our Maryland Genomics team launched its long-read sequencing service using the new PacBio Revio sequencer. So far, the team is getting fantastic yields on a wide variety of sample types—from mammals to fish and insects. They are ready to take on projects for any sample type from anywhere around the globe ([page 8](#))!

Speaking of Maryland Genomics, we have launched our clinical laboratory: The Maryland Genomics Translational and Diagnostics Laboratory (MGTDL). Learn more about the lab and its director Ram Iyer, PhD, D(ABMGG), FACMG ([page 9](#)).

In this issue, we feature two new studies by IGS investigators. One exploring the genetic root of mood disorders in the Old Order Amish lead by Dr. Seth Ament and another one demonstrating that studying *E. coli* strains in the gut microbiome that do not cause diarrhea could lead to new treatments. These studies highlight the quality and importance of the research performed at IGS ([page 17](#)).

Finally, I've always believed genomic research is a combination of art and science. We now have a beautiful piece of art gracing the lobby of the IGS offices in HSFIII on the UMB campus. Thanks to the keen eye of Owen White, PhD, Associate Director of IGS. He discovered the painting "Woven in Coils" by artist Martin Bridge at the artist's gallery in Western Massachusetts. Owen not only purchased the painting, but he also made its strong aluminum frame and hung it himself in the HSFIII lobby. Come to HSFIII to admire this beautiful piece of art that represents what we do at IGS so well ([page 3](#)).

Please enjoy this issue of the *IGS Insider*—and continue to make memories this summer.

Cheers,



**Jacques Ravel, PhD**

ACTING DIRECTOR, INSTITUTE FOR GENOME SCIENCES  
PROFESSOR, MICROBIOLOGY & IMMUNOLOGY, AND MEDICINE  
UNIVERSITY OF MARYLAND SCHOOL OF MEDICINE



## NEW PAINTING HIGHLIGHTS IGS CORE IN HSFIII BUILDING ENTRANCE

When you enter the HSFIII building through its front doors, you will notice a striking new artistic work in the central atrium. It is an oil painting—called *Woven in Coils*—by artist Martin Bridge.

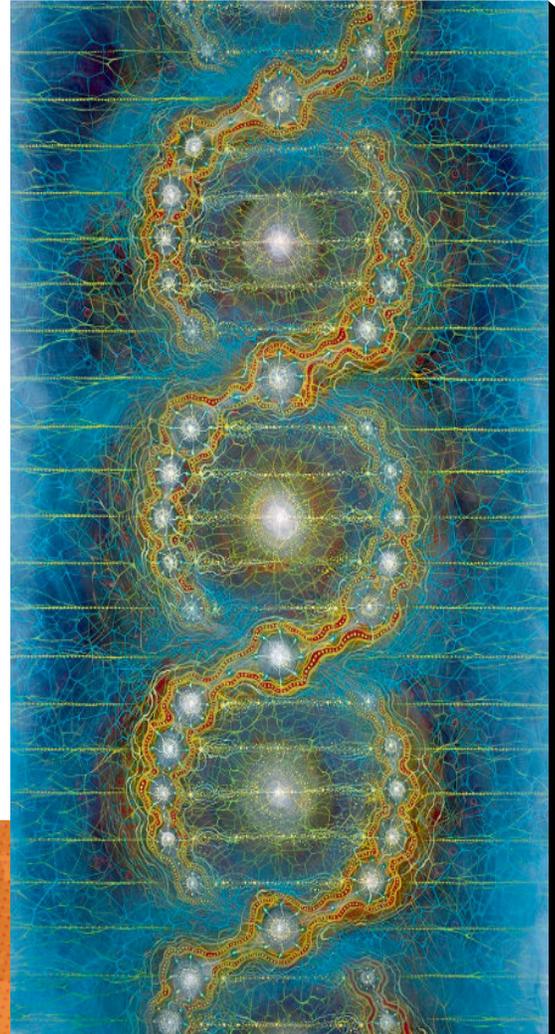
“One of the most central themes to Martin’s work is an exploration of the natural world and our place as humans in relation to the web of life,” says Owen White, PhD, Associate Director of the Institute for Genome Sciences. “I discovered the painting one day at Martin’s gallery in Western Massachusetts. I immediately knew it should be shown in HSFIII because it represents the precision, elegance, and wonderment of research conducted at IGS and UMSOM.”

Dr. White personally constructed the heavy aluminum frame that outlines this painting to ensure it was consistent with the aesthetic beauty of the HSFIII atrium.

“For people who have not seen the painting yet, they should stop by the atrium to be inspired by the ‘miraculous result’ of this beautiful work of art!” says Dr. White.

Artist Martin Bridge and his colleague Steve Trombulak have published the book *The Way of the Gaia* which is “a collection of paintings and prose that speaks to humanity’s relationship to the planet through the lenses of ecology, evolution, and the environment.”

Their book is available here: <https://www.thewayofgaia.org>



# IGS INITIATES ORGANIZATIONAL CHANGES TO EXCEL IN TODAY'S COMPETITIVE LANDSCAPE

The Institute for Genome Sciences has undergone recent organizational changes to empower more faculty members in our ongoing growth.

“As the field of genomics evolves, IGS also needs to remain flexible and responsive to these changes, so that we can continue advancing our leading-edge research,” says Jacques Ravel, PhD, Acting Director of IGS. “These recent changes allow a wider variety of voices to guide our future direction and develop our leadership position in a very competitive landscape.”

With that call to action, IGS has initiated changes in its Executive Committee that recognizes four key areas critical to its competitive growth. The areas and the new Associate Directors are:

## RESEARCH DEVELOPMENT & COLLABORATION



OWEN WHITE, PHD

## RESEARCH



JOANA CARNEIRO DA SILVA, PHD

## EDUCATION AND OUTREACH



MICHELLE GIGLIO, PHD

Translational Clinical Genomics: To Be Determined

In addition, IGS has changed its Promotions & Tenure committee. It will now be led by Hervé Tettelin with Lynn Schriml, PhD, and Michelle Shardell, PhD, as members



HERVÉ TETTELIN, PHD



LYNN SCHRIML, PHD



MICHELLE SHARDELL, PHD

# IGS FOUNDING DIRECTOR CLAIRE FRASER ELECTED TO NAS; BECOMES UMB DISTINGUISHED PROFESSOR; RECEIVES AWARD FROM NEW YORK ACADEMY OF MEDICINE



**CLAIRE M. FRASER, PHD**

DEAN E. ALBERT REECE ENDOWED PROFESSOR IN THE SCHOOL OF MEDICINE  
PROFESSOR OF MEDICINE AND MICROBIOLOGY AND IMMUNOLOGY  
FOUNDING DIRECTOR, INSTITUTE FOR GENOME SCIENCES

The **National Academy of Sciences (NAS)** has announced that Claire M. Fraser, PhD, the Dean E. Albert Reece Endowed Professor in the Department of Medicine at the University of Maryland School of Medicine (UMSOM), and the Founding Director of the Institute for Genome Sciences (IGS), has been elected as a new member of the prestigious academy. Dr. Fraser is one of 120 U.S. and 23 international new members elected on May 2, 2023 to the NAS, bringing its total U.S. membership to 2,565 members.

Dr. Fraser adds this prestigious appointment to a long list of scientific accomplishments during her career in the genomic and microbial sciences.

“I am honored to be recognized in this way by the NAS,” Dr. Fraser says. “Throughout my scientific career, I have collaborated with some great scientists who are also NAS members—and have had the privilege to mentor early-career scientists who may someday also be elected to NAS. While I worked hard for my success, it is these kinds of collaborations that are the backbone of science, and I am thrilled to be included in this esteemed group.”

In addition, Dr. Fraser has been selected by The New York Academy of Medicine (NYAM) to receive The Academy Medal for Distinguished Contributions in Biomedical Science. The Medal in Biomedical Science is given annually to accomplished investigators dedicated to using biomedical research findings to advance human health.

“By boldly leading the way in the uncharted territory of microbial genomics, you have fundamentally reshaped the way scientists and researchers understand human life. Your unparalleled achievements exemplify the spirit of this award,” Ann Kurth, PhD, CNM, MPH, President of NYAM, wrote to Dr. Fraser when notifying her of the award.

Charles Rotimi, PhD, Scientific Director of the National Human Genome Research Institute, will also receive the award this year. Dr. Rotimi was the keynote speaker at IGS’ 15<sup>th</sup> Anniversary Celebration last year.

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*“It is these kinds of collaborations that are the backbone of science, and I am thrilled to be included in this esteemed group.”*

*- Claire M. Fraser, PhD*

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*continued from page 5*

Dr. Fraser also has been given the University of Maryland, Baltimore's designation of Distinguished University Professor, which is the highest appointment bestowed on a faculty member at UMB.

In 1995 when Dr. Fraser was at The Institute for Genomic Research (TIGR) in Rockville, MD, she and her team were the first to map the complete genetic code of a free-living organism—*Haemophilus influenzae*—the bacterium that causes lower respiratory tract infections and meningitis in infants and young children.

Her discovery forever changed microbiology and launched a new field of study—microbial genomics. During that time, she and her team also sequenced the bacteria causing syphilis and Lyme disease, and eventually the first plant genome and the first human-pathogenic parasite. She even helped identify the source of a deadly 2001 anthrax attack in one of the biggest investigations conducted by U.S. law enforcement. In 2007, Dr. Fraser launched IGS at the University of Maryland, which held over 25 percent of the funding awarded by the Human Microbiome Project.

Dr. Fraser came to UMSOM as one of the most highly cited investigators in microbiology. Through her career, she has authored more than 320 scientific publications, is the recipient of numerous awards, and was elected to the National Academy of Medicine in 2011. From 2019 to 2021, she held leadership positions at the American Association for the Advancement of Science (AAAS), serving for one year as President-elect, one year as President, and one year as Chair of the AAAS Board of Directors.



HAEMOPHILUS INFLUENZA



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# MEMOS

# REVVING UP THE PACBIO REVIO

Maryland Genomic's new PacBio Revio is revved up, running, and churning out sequences for researchers from within the University of Maryland and around the world. The group has completed about 30 genome sequencing projects across a wide range of sample types, including mammals, reptiles, fish, amphibians, plants, mollusks, and insects, with an average yield of almost 90 Gb per run, says Luke Tallon, Scientific Director of Maryland Genomics.



PACBIO REVIO

“Although we’re just getting started, we’ve learned that Revio really delivers on the promise of much higher yield—about a three-fold increase from the Sequel IIe system—with shorter run times and significant cost savings,” says Tallon. “High-quality samples are routinely exceeding expected yield and data quality metrics, and even sub-optimal samples are often performing well, demonstrating the robustness of the platform.”

One of the first projects Maryland Genomics ran on the Revio was with Tychele Turner, PhD, from Washington University in St. Louis aimed at evaluating the platform using a mouse cell line sequenced across three SMRT Cells. [A preprint of the findings](#) is now available and shows that the Revio can generate 30x genome coverage in a single SMRT Cell run. Analysis of the genome sequences generated by each SMRT Cell showed consistency in genome coverage, variant detection, methylation detection and *de novo* assembly performance.

“These results are very promising, and we’re looking forward to rapidly expanding our Revio project portfolio to researchers and applications at UMB,” says Tallon.

For more information on the new PacBio Revio or Maryland Genomics sequencing and analysis services, please connect with us at [MarylandGenomics.org](https://www.marylandgenomics.org) and follow Maryland Genomics on Twitter [@MDGenomics](https://twitter.com/MDGenomics) for updates.

## Who can work with Maryland Genomics?

Everyone! We strive to bring the increasing power and decreasing cost of sequencing and analysis to a continually expanding research community. We provide services to a wide range of researchers – from basic scientists to clinicians to computer scientists. Prior experience with high-throughput technologies is not required. And, you can be located anywhere in the world!

## What can I expect?

We work with researchers from both the public and private sector, and our projects span the globe. No matter your experience or expertise, we can guide you through every phase of the process. Each project begins with a complimentary consultation with our scientists and project managers. We use this consultation to learn more about your project goals, and to advise you on project design, platform selection, cost, and timelines. From there, we conduct regular project status and update meetings to ensure the project completes on time and on budget.

## Is my project too small? Too large?

No! We routinely work with projects that range from a single sample to multi-year projects with thousands of samples. On average, we have more than 30 active ongoing projects and process more than 50,000 samples per year.

**Connect with  
Maryland Genomics:**

**MarylandGenomics.org**

Follow Us On  
**@MDGenomics**



# RAMASWAMY IYER, PHD, D(ABMGG), FACMG, HEADS NEW IGS CLINICAL GENOMICS LAB

From finding genetic causes of rare diseases to discovering the right drug for a patient, clinical genomics is changing health care – and now, it will be helping patients around Baltimore, as well.

Maryland Genomics—part of the Institute for Genome Sciences—has launched a new clinical laboratory called the Maryland Genomics Translational and Diagnostics Laboratory (MGTDL). MGTDL is bringing precision medicine to patients within the University of Maryland Medical System.



**RAMASWAMY IYER, PHD, D(ABMGG), FACMG**

**Ramaswamy Iyer, PHD, D(ABMGG), FACMG**, is the laboratory's Executive Director. He brings with him more than 20 years of operational leadership in CAP/CLIA-certified clinical diagnostics laboratories. Dr. Iyer

trained in both Clinical Molecular Genetics and Clinical Cytogenetics at UCLA-Cedar Sinai in Los Angeles. He is board certified by the American Board of Medical Genetics (ABMG) and a fellow of the American College of Medical Genetics and Genomics (ACMG).

“Clinical genomic testing can have a huge benefit to patients and a large cost savings for health care systems,” says Dr. Iyer. “Patients receive more accurate and often faster disease diagnoses, allowing for tailored treatments that can reduce side-effects and improve quality of life.”

There are many different types of clinical genomic testing used in everything from noninvasive prenatal testing to tumor profiling in cancer care, diagnosing rare diseases, and pharmacogenomics.

“Some genes make the body use up medicine too fast, so normal doses don't help them, while others make it hard for the body to get

rid of it, causing what can be severe side effects we call “adverse drug reactions,” explains Dr. Iyer. “So running a pharmacogenomic test before prescribing certain drugs can really help a patient.”

For health care systems savings, Dr. Iyer points to many studies on pharmacogenomic testing that show it greatly reduces costly adverse drug reactions (ADR), including trips to the Emergency Department and sometimes death. In 2019, the Agency for Healthcare Research and Quality (AHRQ) estimated that ADRs accounted for more than 700,000 emergency department visits, about 100,000 hospitalizations, and caused more than 100,000 deaths.

The majority of ADRs are related to drugs used in Cardiology, Oncology, and Neuropsychiatric care, says Dr. Iyer. The reasons for this, include an aging population, many of whom take multiple drugs, uncoordinated and limited access to healthcare, and limited health literacy among patients, meaning they may not understand how to take their medications properly.

“I'm looking forward to helping implement pharmacogenomic and other clinical genetic testing within the University of Maryland Medical System to benefit our patients,” he says.

In addition, MGTDL's services will be available to researchers who can translate novel insights from their science into the clinic. It will also allow scientists to discover ways to better target diseases seen more frequently in patients from Baltimore and Maryland.

Dr. Iyer's experience spans the country, as well as academic, government, and corporate settings. He served as Vice President of the Research Lab and Biobanks for the Inova Translational Medicine Institute. He was Program Manager of the Cancer Genome Atlas Program at the National Cancer

**MGTDL'S MISSION: TO ENHANCE PATIENT CARE AND CLINICAL RESEARCH AT THE UNIVERSITY OF MARYLAND, BALTIMORE, UNIVERSITY OF MARYLAND MEDICAL CENTER, AND UNIVERSITY OF MARYLAND MEDICAL SYSTEM BY PROVIDING TIMELY, RELEVANT, AND VALUABLE GENOMIC TESTING SERVICES TO CLINICIANS AND SCIENTISTS.**

Institute, as well as a Program Manager at the Department of Defense. He also has directed clinical laboratories at the University of Michigan, UCLA, Myriad Genetics, Nationwide Children's Hospital in Columbus, Ohio, and the Inova Fairfax Hospital.

“We are extremely thrilled that Dr. Iyer decided to join our Institute for Genome Sciences and Maryland Genomics,” says Dr. Jacques Ravel, Acting Director of IGS. “His breadth of experience will greatly benefit UMMS patients and will help educate clinicians on the value of genetic testing.”

**ONLY 1:4 TO 1:25 PATIENTS TAKING ONE OF THE 10 LARGEST GROSSING DRUGS IN THE USA SAW A BENEFICIAL EFFECT (2019)**



# WHAT IS A GENOMICS LEARNING HEALTH SYSTEM?

What will “Genomics V3.0” look like in the future? IGS’ Ramaswamy Iyer, PhD, D(ABMGG), FACMG, Executive Director of the Maryland Genomics Translational and Diagnostics Laboratory (MGTDL) answered that at a recent research symposium called “Precision Medicine for Learning Health Systems” held on the University of Maryland, Baltimore campus.

Leading the symposium was Bradley Maron, MD, Senior Associate Dean of Precision Medicine at the University of Maryland School of Medicine and Co-Director of the new Institute for Health Computing. Speakers talked on how to scale up precision medicine, innovating healthcare technologies, and implementing a learning health system within UMMS.

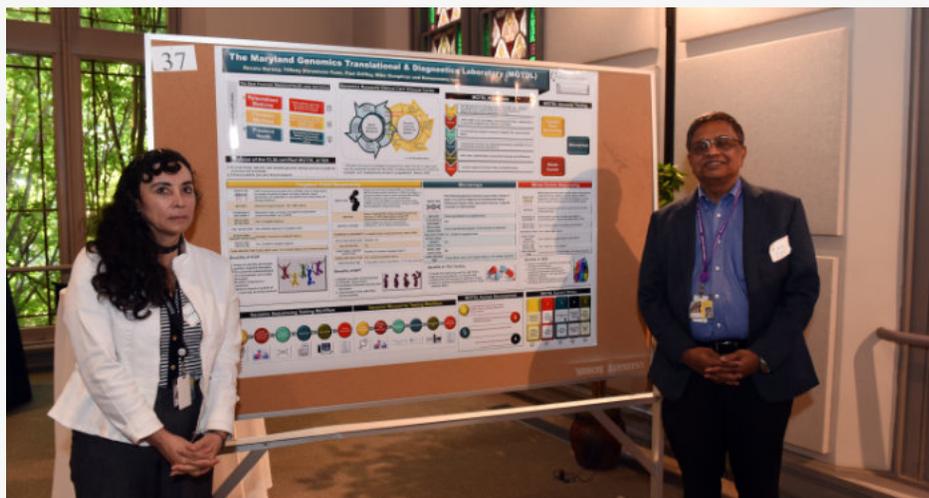
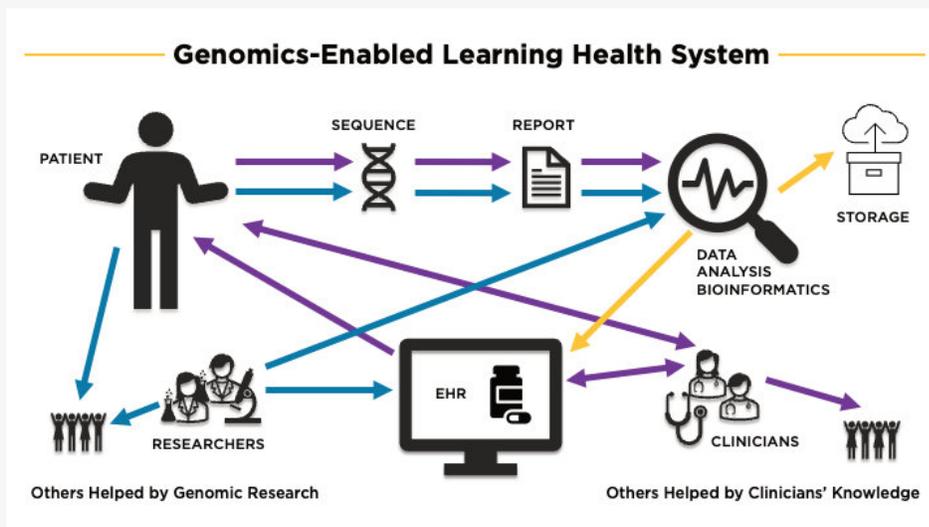
“I was thrilled to be able to speak on this topic because I am passionate that there is no Precision Medicine without genomics and genetic testing,” says Dr. Iyer. “It was the perfect fit since the National Human Genome Research Institute (NHGRI) and the American College of Medical Genetics (ACMG) both strongly promote the idea of a ‘Learning Health System’ with genomics.”

A “Learning Health System” is a health system in which scientific research and clinical practice continuously help each advance and implement best practices for continuous improvement within the system, ultimately improving the quality of care to enhance individual and population health.

“A Learning Health System that uses the best of genomics will revolutionize clinical practice as we know it,” says Dr. Iyer. “Whether in research or clinical care, genomic data is big data that can be mined and used to improve care.”

For example, researchers can combine genetic testing data with patient records in EPIC to find new therapeutic targets for particular diseases. Another example, Dr. Iyer says, is clinicians ordering the most cost-effective testing to help their patients get a medication with the least side effects for their bodies.

Dr. Iyer and members of MGTDL—Rossio Kersey, Tiffany Stevenson-Yuen, Paul Griffey, and Mike Humphrys—also presented a poster during the reception that followed the symposium. The poster focused on the mission and goals of the MGTDL, as well as the types of genetic testing and each of their benefits.



ROSSIO KERSEY WITH RAMASWAMY IYER, PHD, D(ABMGG), FACMG

# MARYLAND GENOMICS' MIKE HUMPHRYS WINS ESTEEMED BOARD OF REGENTS AWARD

Mike Humphrys, MS, Maryland Genomics's Executive Director, Technical, has been awarded the prestigious Board of Regents Staff Award for "Exceptional Contribution to the Institution and/or Unit to Which a Person Belongs" for his work setting up and running a testing lab during the COVID-19 Pandemic.

"Mr. Humphrys is a visionary leader and an integral asset not only to the University of Maryland, Baltimore (UMB) community, but also to the state of Maryland," UMB President Bruce Jarrell wrote in a recommendation letter for this award. "I have chosen the word 'visionary' to describe Mike because he had foresight to act quickly and pivot Maryland Genomics' lab to help the state of Maryland when the COVID-19 pandemic struck in 2020."

Thanks in large part to his vision, IGS received \$2.5 million from the state of Maryland to launch Maryland's first high-throughput COVID-19 testing laboratory. The lab ran 24/7, testing about two million samples and sequenced the genomes of 17,000 viruses.

"The magnitude of the impact the testing operation Mike envisioned and operationalized was essential to saving lives in Maryland and has afforded a strong restart of the state's economy," says Jacques Ravel, PhD, Acting Director of the Institute for Genome Sciences.

Mr. Humphrys previously worked at the Centers for Disease Control and Prevention (CDC) in Atlanta. That work helped him immediately understand the significance of the COVID-19 spread and anticipate well the upcoming challenges, such as ongoing shortages of necessary supplies and equipment, a problem echoing across the US.

"Working strategically, Mike was able to coordinate with long-standing vendors as well as source new products that helped to alleviate much of the supply bottleneck," adds Dr. Ravel. "To implement such operation takes a team, and I should not forget to acknowledge that a large team of laboratory technicians and scientists, clinicians, regulators, and administrators from IGS, UMPA, the University Maryland Medical System (UMMS), University of Maryland Baltimore, University of Maryland School of Medicine collaborated and worked long hours as part of a task force to realize this large-scale testing operation."

Working with his team and IGS leadership, Mike set up a high-throughput COVID-19 testing facility by repurposing the robotic equipment in his core laboratory and leveraging his technical and operational knowledge. He rapidly gathered supports from IGS leadership, University of Maryland Pathology Associates (UMPA), and hospital staff, and started preparations to operationalize a CLIA-certified testing lab precious weeks ahead of anyone else.

Within Maryland Genomics, Mike is responsible for laboratory R&D, new assay development, and automation systems. In addition to that work, he has been published in more than 30 peer-reviewed journals and is currently the PI on a large grant to provide technical and sequencing analysis of microbiome samples for the French National Center for Scientific Research. In 2020, UMB recognized him with the UMB Champions of Excellence Award and recently he accepted a framed poster from Dr. Ravel to hang outside the Maryland Genomics Laboratory in recognition of the entire team's work during the COVID-19 pandemic.



JACQUES RAVEL, PHD, ACTING DIRECTOR OF IGS, PRESENTS MIKE HUMPHRYS WITH A POSTER COMMEMORATING THE MARYLAND GENOMICS TEAMS'S WORK TO LAUNCH MARYLAND'S FIRST HIGH-THROUGHPUT COVID-19 TESTING LABORATORY DURING THE PANDEMIC.

# MD/PHD STUDENT MADDY ALIZADEH WINS UNIVERSITY SYSTEM OF MARYLAND AWARD



(left to right) T DENISE WILKERSON, CHIEF OF STAFF TO THE USM CHANCELLOR, MADDY ALIZAHDEH, UMB PRESIDENT BRUCE JARRELL, MD, AND JAY PERMAN, MD, CHANCELLOR OF THE UNIVERSITY SYSTEM OF MARYLAND Photo credit: Richard Lippenholz

Maddy Alizadeh, in her third year as PhD student in the University of Maryland School of Medicine’s (UMSOM) Genome Biology Track and a fifth year MD/PhD student in the Ravel Lab at the Institute for Genome Sciences, received the University System of Maryland’s (USM) highest award for a student: USM Regents Student Excellence in Academics, Scholarships, and Research.

She was one of three students, the only graduate student honored with this highly competitive award—and the only student from the University of Maryland, Baltimore (UMB)—to receive an award all categories combined.

Maddy credits her success to her co-advisors: Jacques Ravel, PhD, Acting Director of IGS, and Erik von Rosenvinge, MD, UMSOM Professor of Medicine and Chief of Gastroenterology at the VA, as well as close mentors Ray Cross MD, MS, UMSOM Professor and Director of the IBD Program and Codirector of the Digestive Health Center at the University of Maryland Medical Center, and Jean-Pierre Raufman, MD, Moses and Helen Golden Paulson Professor of Medicine and Chief of the Division of Gastroenterology & Hepatology.

Her research focuses on finding how the gut microbiome contributes to people with Inflammatory Bowel Disease (IBD) developing additional non-intestinal complications—known medically as Extraintestinal Manifestations (EIMs). She has published over 10 peer-reviewed articles and recently won the “Young Investigator’s Award” from the Crohn’s and Colitis Foundation.

“Maddy’s boundless energy, deep knowledge of the topics and organization skills have allowed her to be so successful,” says Jacques Ravel, IGS Acting Director and Maddy’s mentor. “We are very proud to have Maddy represent IGS, the School of Medicine and the entire University System of Maryland. This honor is well-deserved!”



MADDY ALIZADEH WITH HER MENTORS JACQUES RAVEL, PHD, (left) AND ERIK VON ROSENVIINGE, MD, (right) WHO IS A PROFESSOR IN MEDICINE AND CHIEF OF GASTROENTEROLOGY AT THE VA MARYLAND HEALTH CARE SYSTEM. Photo credit: Richard Lippenholz

*“I’m just so fortunate to have incredible mentors who have supported me every step of the way in this journey and have helped me learn and grow so much as a scientist!”*

*- Maddy Alizadeh*





# THREE CHEERS!

## CELEBRATING OUR IGS COLLEAGUES PROMOTIONS, AWARDS, AND ACCOLADES!



FRANCK DUMETZ, PHD



MICHAEL FRANCE, PHD



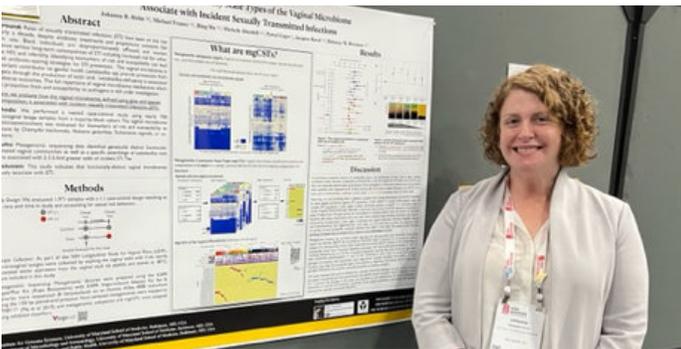
BRIAN HERB, PHD

**Franck Dumetz, PhD**, to Research Associate  
**Michael France, PhD**, to Research Associate  
**Brian Herb, PhD**, to Research Associate

**Ram Iyer, PhD, D(ABMGG), FACMG**, to Associate Professor, Endocrinology, Diabetes and Nutrition Division in the Department of Medicine. Dr. Iyer also is Executive Director of Clinical Genomics at IGS's Maryland Genomics.

**Hnin Lwin, MS**, to Laboratory Research Specialist  
**Joseph Receveur, PhD**, to Bioinformatics Analyst II

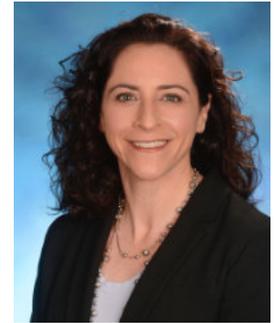
### ACCOLADES TO!



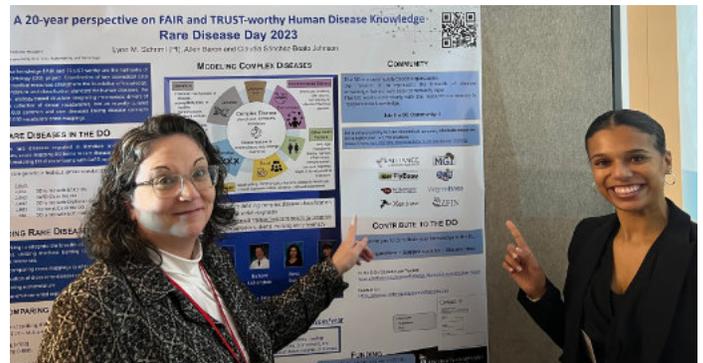
JOHANNA HOLM, PHD

**Johanna Holm, PhD**, has received the Peggy Cotter Award for Early Career Branch Members from the American Society for Microbiology. The award of \$1650 allowed her to attend the American Society of Microbiology's Microbe 2023 in Houston in June.

**Rebecca Brotman, PhD**, and her student and lead author Sarah Brown, PhD, made the American College of Obstetrician and Gynecologist's "Top Headline" on June 14 for their research published in the Journal of Infectious Diseases, **Bacterial Vaginosis and Spontaneous Clearance of *Chlamydia trachomatis* in the Longitudinal Study of Vaginal Flora.**



REBECCA BROTMAN, PHD



LYNN SCHRIML, PHD, CLAUDIA SANCHEZ-BEATO JOHNSON, MS

**Lynn Schriml, PhD**, was an invited expert for A White House Virtual Roundtable on Data for Bioeconomy hosted by the Office of Science and Technology Policy. Dr. Schriml spoke about the **Genomics Standards Consortium** and the **Human Disease Ontology Project**.

And, speaking of the Human Disease Ontology Project...Dr. Schriml and Claudia Sanchez-Beato Johnson, MS, Bioinformatics Analyst I at IGS, presented the poster A 20-year Perspective on FAIR and TRUST-worthy Human Disease Knowledge at the Rare Disease Day at the NIH. The poster explained the importance of including rare diseases in the Disease Ontology that has currently catalogued more than 11,200 genetic, infectious, environmental diseases, syndromes, and cancers...One more bit of news: the Disease Ontology has opened a public SLACK channel to keep up with what they're working on. Join here: <https://humandiseasonology.slack.com/ssb/redirect>



continued from page 13

## BEST PAPERS!

Each year, a committee comprising of two IGS faculty and an external research scientist selects two papers that highlight ‘omics science at its best among trainees and early career faculty members. “This year was highly competitive,” says Jacques Ravel, PhD, Acting Director of IGS. “It is a testament to the scientific quality IGS produces.”

The Best IGS Trainee-Led Omics Paper winner is Michael France, PhD, who at the time was a postdoctoral fellow in the Ravel Lab and has since been named to IGS faculty as a Research Associate. The paper, [Insight into the Ecology of Vaginal Bacteria through Integrative Analyses of Metagenomic and Metatranscriptomic Data](#), appeared in the March 2022 issue of *Genome Biology*. The research looked at vaginal microbiota communities in healthy women and determined that the abundance of a species is not an indicator of its transcriptional activity and that impending composition changes can be predicted from metatranscriptomic data. Using gene expression data, Dr. France elucidated novel aspects of the vaginal microbiota ecology that are being translated into novel interventions to modulate the composition of the vaginal microbiota to treat conditions such as recurrent bacterial vaginosis.



JACQUES RAVEL (right), PHD PRESENTING AWARD TO MICHAEL FRANCE, PHD (left)



BING MA, PHD

The Best Omics Paper by an Early Career Faculty Member winner is Bing Ma, PhD, Assistant Professor in the Department of Microbiology and Immunology and an IGS Scientist. The paper, [Highly Specialized Carbohydrate Metabolism Capability in Strains Associated with Intestinal Barrier Maturation in Early Preterm Infants](#), appeared in the June 2022 issue of *mBio*. Dr. Ma and her colleagues discovered a strain of the *Bifidobacterium breve* bacteria (or *B. breve*) in the gut of breastfed babies who received higher volumes of breastmilk than both formula-fed babies and breastfed babies with “leaky gut.” For the first time, the team found that the way *B. breve* metabolizes breastmilk keeps

breastfed babies healthier and allows them to gain weight by strengthening their underdeveloped intestinal barriers.



JACQUES RAVEL, PHD PRESENTING AWARD TO BING MA, PHD

# SERVICE AWARDS

# Congratulations!

IGS ACTING DIRECTOR JACQUES RAVEL, PHD, PRESENTS SERVICE AWARDS



## 35 YEARS

- ★ Karen Clifford



ANUP MAHURKAR



DAVID SHOEMAKER

## 15 YEARS

- ★ Anup Mahurkar
- ★ Suvarna Nadendla
- ★ Joshua Orvis
- ★ Luke Tallon



KATHY O'KEEFE



MARCIA CORTES-GUTIERREZ



ANKIT DWIVEDI, PHD

## 10 YEARS

- ★ Kathy O'Keefe
- ★ Yang Song



DANAY RODRIGUEZ

## 5 YEARS

- ★ Marcia Cortes-Gutierrez
- ★ Adonis Dmello
- ★ Ankit Dwivedi
- ★ Lance Nickel
- ★ Danay Rodriguez
- ★ David Shoemaker



ADONIS DMELLO, PHD



SUVARNA NADENDLA



YANG SONG, PHD

# Under the Microscope

A look at IGS featured research



# 1

## Discovery: Unique Genetic Signature for Mood Disorders in the Old Order Amish

**LEAD RESEARCHER:** Seth Ament, PhD

**PUBLISHED IN:** *Molecular Psychiatry*



SETH AMENT, PHD

Understanding the root causes of depression, bipolar disorder, and other mental illnesses could lead to new treatments for the 300 million people worldwide who suffer from such conditions.

Now, a collaborative team led by University of Maryland School of Medicine (UMSOM) faculty affiliated with the Institute for Genome Sciences (IGS), the Program in Personalized and Genomic Medicine (PPGM), and the Maryland Psychiatric Research Center (MPRC) have found previously unknown changes in four regions of the genomes of Old Order Amish individuals which increase their risk for mood disorders.

This finding was published in a recent issue of *Molecular Psychiatry* and could lead to a deeper knowledge of the causes of mental health illnesses in a broader population — as well as potential targets for new drug development. Researchers at the National Institute of Mental Health and the University of Pennsylvania are co-authors on this study.

“What we knew prior to our study is that genetic factors account for up to 80 percent of risk for bipolar disorder and up to 50 percent of risk for major depressive disorder,” said the study’s senior author, Seth Ament, PhD, Associate Professor of Psychiatry at UMSOM and a scientist at IGS. “Most affected people in the general population inherit many risk variants, each of which has a very small effect. But in the Amish population, we were able to identify specific genetic variation in four chromosomal regions that double or triple someone’s risk for having a mood disorder.”

The Old Order Amish in Lancaster, Pennsylvania descends from approximately 400 original founders who came to the United States in the 1720s and still rarely marry outside of the group. This close genetic relationship—known as the “Founder Effect”—makes the Amish ideal for researchers to study. Certain genetic changes, including some that can greatly increase disease risk, occur much more frequently within the group—and may be rare or even absent in the general population.

The researchers looked at data from the genomes of 1,672 Old Order Amish adults that included families in which multiple family members were affected with mood disorders. They performed statistical analyses on the participants’ genome sequences to identify specific patterns of genetic variation that were more common in affected participants, using a technique known as a Genome-Wide Association Study (GWAS).

What they discovered is that genetic variation in four chromosomal regions each doubled a person’s risk for getting a mood disorder. Follow-up studies showed that the variants also influence related traits, such as slower cognitive abilities.

The researchers identified several genes at these locations that are known to influence brain development. In future studies, they hope to learn more about the specific changes in the brain by which these genes alter disease risk. Knowledge of these variants may lead to personalized approaches to treatment.

*Additional authors from the Institute for Genome Sciences include Elizabeth Humphries, PhD, and Evalina Mocci, PhD.*

# 2

## Discovery: Understanding *E. coli* Strains That Do Not Cause Diarrhea Could Lead to New Treatments

**LEAD RESEARCHERS:** Tracy Hazen, PhD & David Rasko, PhD

**PUBLISHED IN:** *Nature Communications*

News reports featuring *E. coli* often tell terrifying stories of intestinal illness and diarrhea or deadly outbreaks from contaminated food. There are, however, many different strains of the bacteria *E. coli*, or *Escherichia coli*, and not all are bad.

Some *E. coli* may, in fact, play a key role in protecting the human gastrointestinal tract from severe illness, discovered researchers at the University of Maryland School of Medicine's (UMSOM) Institute for Genome Sciences (IGS). Their work was published in a March issue of *Nature Communications*.



DAVID RASKO, PHD

"*E. coli* is a natural and common part of a healthy gut microbiome. Yet, most studies focus on the isolates that cause diarrheal disease," said study corresponding author David Rasko, PhD, Professor of Microbiology and Immunology at UMSOM, and a Scientist at IGS. "With our study, we wanted to examine the role that non-pathogenic *E. coli* plays. Could it be protective against illness?"

The researchers used data from *E. coli* strains from a group of 300 boys and girls under the age of five from countries in Sub-Saharan Africa and south Asia. The study that provided the strains — the Global Enteric Multicenter Study (GEMS) was administered through UMSOM's Center for Vaccine Development and Global Health — was a three-year case-controlled investigation of the causes of diarrhea (bacteria, viruses, and parasites) among children. The genomic data of the *E. coli* strains from children with and without diarrhea were examined to identify differences that may have caused the clinical outcomes. It is rare to have strains from healthy individuals to examine.

We found these strains were more closely related to the dangerous *E. coli* strains than we expected, causing us to hypothesize that they may play a protective role in the gut, essentially by blocking out their disease-causing relatives," said Tracy Hazen, PhD, Assistant Professor of Microbiology and Immunology at UMSOM, an IGS researcher, and lead author on the study. "We were surprised by the genetic diversity among the non-diarrhea *E. coli* causing strains."



TRACY HAZEN, PHD

Another important finding in the study was that the *E. coli* within the children with diarrhea had significantly more antimicrobial resistance genes compared to the strains from children without diarrhea. The prevalence of bacteria with these antimicrobial resistance genes also means that there is a reservoir of these genes to be distributed to other *E. coli* and gastrointestinal bacteria, possibly making them even more resistant to treatment.

"This suggests that there is a dynamic relationship between the strains that may shift over time depending on what happens with the host immune response and the interaction with the microbiome — in this case, within the child's gut," Dr. Rasko explained.

With the observed genetic similarities of the strains, the researchers acknowledge that this poses a chicken-and-egg question: Do 'good' *E. coli* have the potential to evolve into the strains that cause illness? Or, did they start out as pathogenic strains that evolved protective properties?

Answering that question could lead to potential treatments for diarrheal diseases.

*Jane Michalski, MS, Senior Research Manager at the Institute for Genome Sciences also contributed to this research.*

# CLAIRE FRASER AND RONNA HERTZANO FEATURED IN NEW BOOK ON WOMEN IN STEM

## RESILIENCE. PATIENCE. PERSEVERANCE.

Those are the traits shared by the 29 women STEM leaders—including two from IGS—featured in the new book *Lessons Learned: Stories from Women Leaders in STEM*, according to its author Deborah Shlian, MD (UMSOM '72), MBA.

“I was frankly a little surprised that so many of the women said that their career journeys had been improbable,” says Dr. Shlian. “Several took a few detours before finding their passion, and more than a few encountered stereotypes that discourage young girls from developing interests and skills in math and science.”

Dr. Shlian says she was inspired to put together the book by **Claire Fraser, PhD**, Founding Director of the Institute for Genome Sciences.

“Dr. Shlian had published a book on women leaders in medicine, so I suggested she do one on women in scientific fields,” says Dr. Fraser. “I was honored to be included in the book, as well.”

Each of the 29 women featured wrote their own stories. Dr. Fraser’s is in Chapter Six: The Road Less Traveled an homage to the Robert Frost poem which opens the chapter. She quotes Frost throughout, including these prophetic lines: Being the boss anywhere is lonely. Being a female boss in a world of mostly men is especially so.

She talks about her passion for science being ignited in ninth grade by a teacher and then assuming she would go to medical school, even applying to some.

“I had an epiphany that what I really wanted to do was pursue a research career,” she says. “In a hasty and very uncharacteristic way, I applied to a handful of graduate schools and chose the State University of New York at Buffalo.”

One of the main lessons she learned, she recalls, was early in her career working at NIH.

“I learned how to be fearless in approaching scientific research,” she says. “It’s all too easy not to pursue the most difficult experiments for fear that things won’t work.”

The chapter continues step-by-step through Dr. Fraser’s stellar scientific career which includes a long list of sequencing firsts in genomics and founding the field of microbial genomics.

**Ronna Hertzano, MD, PhD**, Affiliate Faculty at IGS and now Chief of the Neurotology Branch in The National Institute on Deafness and Other Communication Disorders at NIH, is featured in Chapter Thirteen: Game Changer.

Dr. Hertzano’s early influences came from both her parents. Her father ran the family business of manufacturing the game Rummikub, created by her grandfather who was living in Romania in the 1940s when playing cards were outlawed. The game uses tiles instead and combines elements from rummy, dominoes, mah-jongg, and chess. Her mother—who started a PhD program in Audiology—but was never able to finish due to moves between Israel and the United States for the game business—worked to develop tools for early detection of hearing loss in children and implemented Israel’s first hearing screenings for newborns.

A national champion long jumper, she considered joining the family business, but knew how much she had loved biology since middle school. It was her mom who first suggested she go to medical school. She never considered a PhD, until she recognized the passion ignited in her from working with mice with inner-ear problems in research labs while in school.

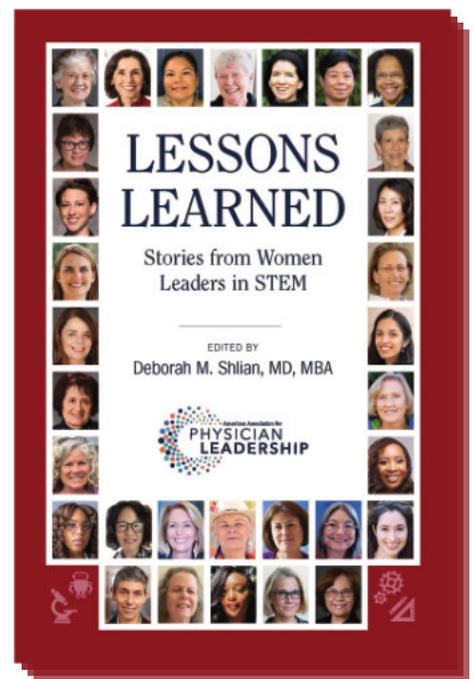
“Once I found a home at IGS, with the mentorship and unwavering support of Claire Fraser, I knew that it would be possible to

combine science and research, along with working with patients, to advance discovery of treatments for patients with hearing loss and inner ear disease,” says Dr. Hertzano. “The genetics of the ear fascinated me, and as more tools were developed to understand this, I was hooked.”

While at IGS, Dr. Hertzano created gEAR (gene Expression Analysis Resource) a genomic database with a variety of visualization and analysis tools for scientists to share and analyze gene expression data relating to the ear and hearing loss.

“My hope for the book is that girls and women will find someone whose story they can identify with,” says author Dr. Shlian. “Someone who will not only inspire them to consider becoming scientists, but also to strive to attain leadership roles within their fields.”

The book can be ordered from Amazon or from The American Association of Physician Leadership.



# IGS'S MEDIA HIGHLIGHTS

The Institute for Genome Sciences faculty have had a banner few months being interviewed in the media for their expertise in everything from the vaginal microbiome to diversity in genomic databases. Read all articles here:

**In *Healio*:** [IGS's Dr. Rebecca Brotman discusses if optimizing the vaginal microbiome could naturally clear a chlamydia infection.](#)

**In *Science News*:** [IGS's Dr. Tim O'Connor discusses the importance of the release of the first human pangenome which will add much needed diversity to genomic research.](#)

**In *Refinery29*:** [IGS's Dr. Jacques Ravel discusses the vaginal microbiome in light of new at-home tests on the market.](#)

**In *Science*:** [IGS's Julie Dunning Hotopp comments on research involving horizontal gene transfer.](#)

**In *Nature*:** [IGS's Dr. Claire Fraser is mentioned for her research team's being the first to create a Pangenome of a lethal bacteria.](#)

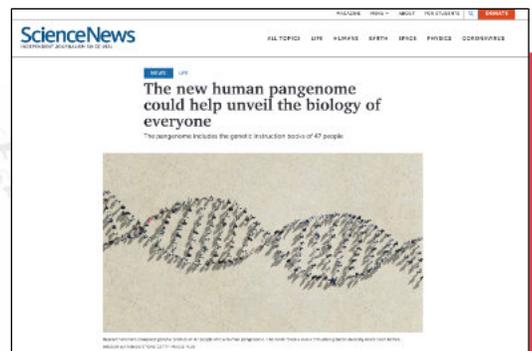
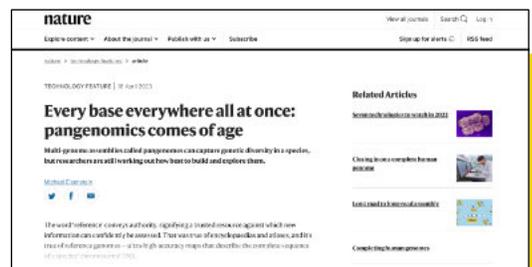
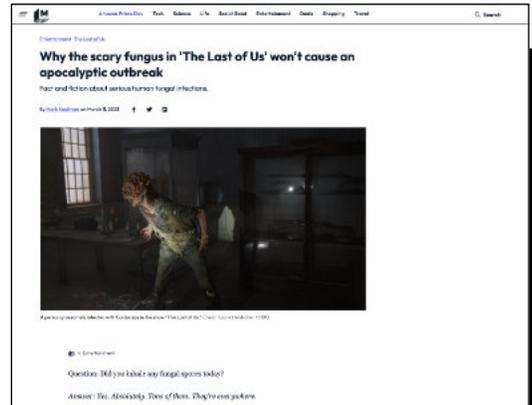
**In *Vogue*:** [IGS's Dr. Jacques Ravel has his research cited on the vaginal microbiome.](#)

**In *Frontline Genomics*:** [Article discusses IGS's Dr. Dave Rasko's research on non-diarrheal causing \*E. coli\*.](#)

**In *Live Science*:** [IGS's Dr. Jacques Ravel discusses the importance of a healthy vaginal microbiome for protecting against sexually transmitted infections.](#)

**In *Mashable*:** [With fungal infections spreading through hospitals, IGS's Dr. Vincent Bruno talks about fighting off fungal infections.](#)

**In *Mashable*:** [IGS's Dr. Vincent Bruno explains global warming's effect on fungal infections linked to a fictitious pandemic shown on HBO's the "Last of Us".](#)



# NEW AFFILIATE FACULTY MEMBER



## WELCOME BRANTLEY HALL, PHD, IGS AFFILIATE FACULTY MEMBER

Brantley Hall, PhD, Assistant Professor of Cell Biology and Molecular Genetics at the University of Maryland, College Park, has been named an Affiliate Faculty Member at the Institute for Genome Sciences. He joins four other Affiliate Faculty members at IGS.

### BRANTLEY HALL, PHD

Dr. Hall received his PhD in Genetics, Bioinformatics, and Computational Biology from Virginia Tech in 2016. He then

joined the Laboratory of Ramnik Xavier, MD, FAAN, in the Center for Computational and Integrative Biology at the Broad Institute of MIT and Harvard and Massachusetts General Hospital studying the human gut microbiome. Shortly after, Dr. Hall received the Helen Hay Whitney Postdoctoral Fellowship, under which he developed PhaseFinder, a new algorithm to identify phase-variable regions in bacterial genomes. He also worked on human cohorts of Inflammatory Bowel Disease patients such as the Longitudinal Stool Study and the Human Microbiome Project II.

Since 2020, at the University of Maryland, Dr. Hall's lab studies the human gut microbiome with the goal of identifying the bacterial genes underlying health-relevant functions of the gut microbiome. He is also passionate about developing new strategies to measure gut microbial activities and metabolites with new assays and devices.

"I believe that there is an enormous potential to modulate the human gut microbiome to promote health," says Dr. Hall. "To achieve this goal, my lab is striving to achieve a better understanding of the biochemical functions performed by the human gut microbiome and how these are related to gastrointestinal disease."

His laboratory's two key projects focus on unraveling the mechanisms behind how the microbiome interacts with the liver, bile ducts, and gallbladder, as well as developing wearable devices to measure gut microbial metabolites in real time to diagnosed gastrointestinal disorders.

"Dr. Hall's work on the microbiome's link to diseases such as Inflammatory Bowel Disease is critically important to eventually translating it into the clinic to help develop innovative diagnostic devices and therapeutics for patients," says Jacques Ravel, PhD, Acting Director of IGS. "We look forward to multiple collaborations with his team in College Park."

***"I believe that there is an enormous potential to modulate the human gut microbiome to promote health."***

***- Dr. Hall***

## PUBLICATIONS

DJ Braccia, GM Ndjite, A Weiss, S Levy, S Abeysinghe, X Jiang, M Pop, Hall B. 2023. Gut Microbiome-Wide Search for Bacterial Azoreductases Reveals Potentially Uncharacterized Azoreductases Encoded in the Human Gut Microbiome. *Drug Metabolism and Disposition* 51 (1), 142-153.

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## HOW TO BECOME AN IGS AFFILIATE FACULTY MEMBER

Becoming an IGS Affiliate Faculty member is open to University of Maryland faculty who will promote the basic research, collaboration, and teaching missions of the Institute for Genome Sciences. Appointments are evaluated for renewal every three years.

To apply to become an Affiliate Faculty Member, please read the full requirements and fill out this [application](#). Applications are reviewed by a committee that makes recommendations to the IGS Director.

# IGS CELEBRATES FIRST TAKE YOUR CHILD TO WORK DAY

It can be tough for kids to understand exactly what their parents do in their jobs, especially when that parent is a scientist. But 17 children of IGS faculty and staff got to see firsthand on April 27 when they spent the day at the Institute for Genome Sciences.

Michelle Giglio, PhD, Associate Director for Education and Outreach at IGS and Associate Professor of Medicine at the University of Maryland School of Medicine, organized the day's activities, along with her colleague Joe Receveur, PhD, Bioinformatics Analyst at IGS.

In the morning, students in fourth through eighth grade learned about DNA, made DNA models, and even did a hands-on experiment extracting DNA from strawberries. In the afternoon, they learned about cells and organelles and acted out how organelles work.

***"The students were really engaged, and everyone had fun."***

***- Dr. Giglio***

High school students toured the University of Maryland, Baltimore campus and the IGS labs before attending a discussion about the different types of careers at IGS. There, they discussed careers in software engineering, science and medicine, and marketing. The students asked a variety of questions such as, "Do I need a PhD or masters?" and "What is ChatGPT?"

"My oldest, Zoe, keeps telling me random stories and facts from her campus tour," says Robin Bromley, Lab Research Supervisor at IGS. "Recently she talked about how crazy it is that we have sequencing machines showcasing how it used to take weeks, then days, and now hours to do sequencing. It clearly made an impact."

The students attending the day were: Marwan El-Kamary (Michelle Shardell); Cedric Hotopp (Julie Dunning Hotopp); Maya and Uma Iyer (Ram Iyer); Angeline and Michelle Kersey (Rossio Kersey); Boris Klimov (Daria Gaykalova); Ian McIntosh (Carrie McCracken); Mia and Zoe Munroe (Robin Bromley); Grayson Ortiz (Stacy Holton); Rami Rakhimov (Riva Yevdayev); Emmerson Rasko (Dave Rasko); Luke Ravel (Jacques Ravel); Emilie and Sophie Serre (David Serre); and Adrian Twele (Dayna Twele).



(left to right) SOPHIE SERRE, EMMERSON RASKO, AND EMILIE SERRE



MIA AND ZOE MUNRO, DAUGHTERS OF ROBIN BROMLEY, TAKE A SELFIE TOGETHER OUTSIDE OF THE IGS LABS AND OFFICES.

# SAVE THE DATE

September 19, 2023

## MICROBIOME ANALYSIS WORKSHOP

This workshop will provide attendees with in-depth training on analysis of bacterial community sequence data, both whole metagenome shotgun and 16S rRNA gene sequences. Tools for community profiling, gene clustering, and annotation will be explored.

For more information, [click here](#).

Please Register on Eventbrite  
10:00am - 5:00pm

December 8, 2023

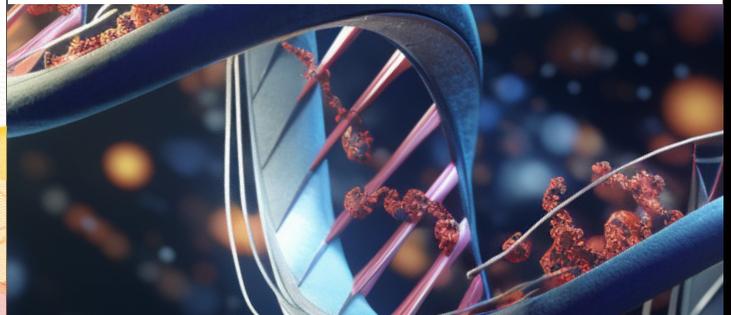
## 2023 FRONTIERS IN GENOMICS LECTURE

Eran Segal, Weizman Institute of Science, Tel Aviv



ERAN SEGAL, PHD

[Dr. Segal's](#) laboratory is a multi-disciplinary lab comprising of computational biologists focused on microbiome, genetics and nutrition within large-scale and deeply phenotyped human cohorts. His research aims to develop personalized nutrition and precision medicine using machine learning, computational biology, probabilistic modeling, and analysis of heterogeneous genomic and clinical data.



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