

IGS NEWSLETTER

FALL 2013

GREETINGS COLLEAGUES,

Welcome to the first issue of the Institute for Genome Sciences newsletter. There is always much going on here, and by sharing highlights of our work, we hope to encourage discussion about our research, spark new opportunities for collaboration, and enhance genomics awareness across the campus. Our 19 faculty members bring a diverse set of skills and expertise to our research program, and our collaborations involve faculty across the University of Maryland system, as well as around the world.

IGS celebrated its fifth anniversary on this campus with a day-long symposium in October 2012 entitled "Frontiers in Genomics." We had a standing-room only crowd in the School of Nursing auditorium and our speakers, Drs. Julian Parkhill, Elaine Ostrander, Michael Snyder, and John Quackenbush, provided a stimulating overview of the impact and potential of genomics on both basic and clinical research. For those of you who weren't able to join us, please check the video of our four stellar presenters:

MORNING PROGRAM

AFTERNOON PROGRAM

The MPower Initiative, which is facilitating exciting collaborations between UM College Park and UMB, has led to the launch of the **Center for Health-Related Informatics and Bioimaging (CHIB)**. Dr. Owen White, Director of Bioinformatics

at IGS, was recently named the Director of CHIB at UMB. He brings more than 20 years of experience in the bioinformatics field to this position and explains CHIB's role in medical and computational biological research later in our newsletter.

Dr. Jacques Ravel, Associate Director of Genomics at IGS, is co-editor of a **new publication – Microbiome** – highlighting innovative studies of microbial communities. Congratulations also to Dr. Ravel on his recent election as Fellow to the American Academy of Microbiology, a prestigious honor.



As we begin a new academic year, we look forward to the continued expansion of the Genome Biology track within the Graduate Program in Molecular Medicine. Under the expert oversight of Dr. Scott Devine, who is currently serving as Track leader, we are expanding the opportunities for students to gain hands-on experience with genomics and computational biology approaches to important biological questions.

In today's interconnected world, our IGS "family" is more global than ever before. We are excited to welcome a new faculty member to IGS, Dr. Timothy O'Connor. The arrival of Dr. O'Connor expands our expertise in bioinformatics. We also welcome our new post-docs and researchers and hope you stay connected to our IGS family, wherever you are located.

Claire Fraser
DIRECTOR



FEATURED



*Owen White, PhD,
Director of Bioinformatics
Institute for Genome Sciences
University of Maryland School of Medicine*

CHIB: THE “MPOWER” OF INFORMATICS

One of the UM’s “MPower” initiatives is the launching of the **Center for Health-Related Informatics and Bioimaging (CHIB)**, formed to leverage the research in computer science, medicine, and informatics technology across the UM system. Leadership of CHIB is divided between the campuses in College Park and in Baltimore. Amitabh Varshney, PhD, professor of computer science and director of UMCP’s Institute for Advanced Computer Studies, will lead efforts in College Park. Owen White, PhD, director of the Department of Bioinformatics at the Institute for Genome Sciences and professor in the School of Medicine at UMB, will direct CHIB activities at UMB.

The new center’s mission is to develop clinical, genetic, imaging, decision-management, patient safety, and public health informatics capacities at the University of Maryland in order to expressly support research innovation in these important domains.

“CHIB will support projects that apply advances in computing power to enable mining and analyzing vast amounts of data at the molecular, genetic and cellular levels, with the goal of improving health,” said Owen White. “It brings together the extensive expertise in clinical, biological, imaging, and bioinformatics from UMB and UMCP.”

CHIB will incentivize researchers to transition their research into practice through translational science and the facilitation of startup companies. It will be a major driver of translating research into practical benefit for Marylanders and be a contributor to global health initiatives.

DR. TIMOTHY O'CONNOR

Here's a warm welcome to our newest faculty addition, Dr. Timothy O'Connor! Dr. O'Connor comes to us from the University of Washington in Seattle, where his research focus has been applying population and evolutionary human genetics to better understand disease.

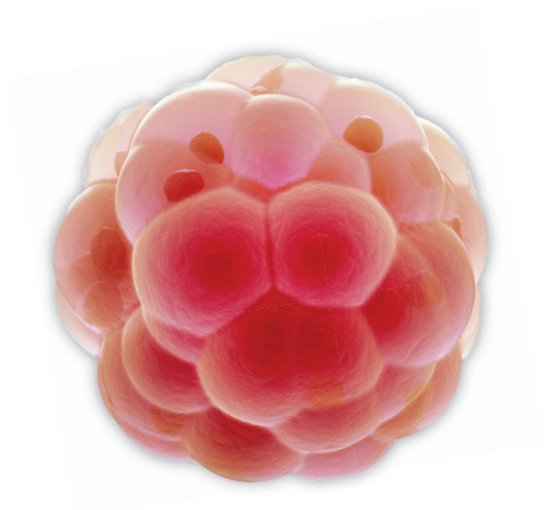
Dr. O'Connor's extensive interdisciplinary educational background included biology and computational analysis, and he was awarded his doctorate in Evolutionary Genomics from the University of Cambridge as a Gates Cambridge Scholar, with a thesis on "Detecting Evolutionary Dynamics of Genotype-Phenotype Association." He is enthusiastic about being part of IGS and is an Assistant Professor at the University of Maryland School of Medicine in the Department of Medicine, Division of Endocrinology, Diabetes and Nutrition.

Some highlights of Dr. O'Connor's research involves exomes and next generation sequencing analysis with AIDS resistant communities, as well as participating in a Consortium on Asthma among African-ancestry Populations in the Americas (CAAPA). He also looks forward to collaborative research on Amish populations with Dr. Alan Shuldiner's group.

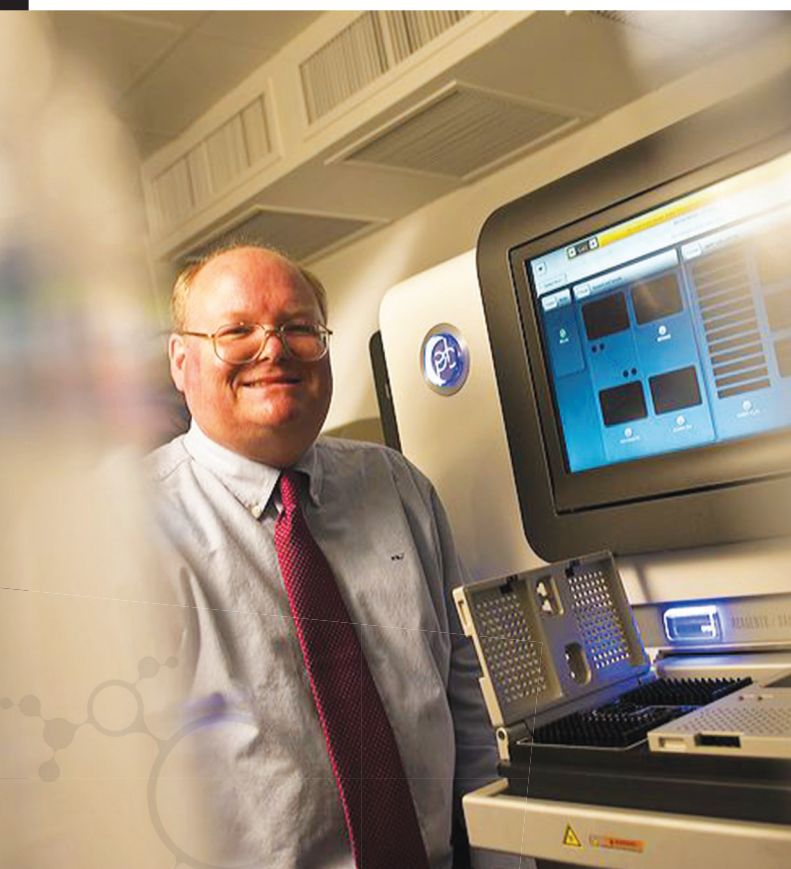
More about Dr. O'Connor's research



Dr. Timothy O'Connor



IN THE NEWS



*Scott E. Devine, PhD
Associate Professor, Medicine
UM School of Medicine*

NEW GENOMICS CONTENT FOR UMB GRADUATE SCHOOL

Scott E. Devine, Associate Professor of Medicine, University of Maryland School of Medicine is now the Track Leader for the Molecular Genetics, Genomics and Bioinformatics Track at the UMB Graduate Program in Life Sciences (GPILS). **More**



IGS WORKSHOP AT ASM ANNUAL MEETING

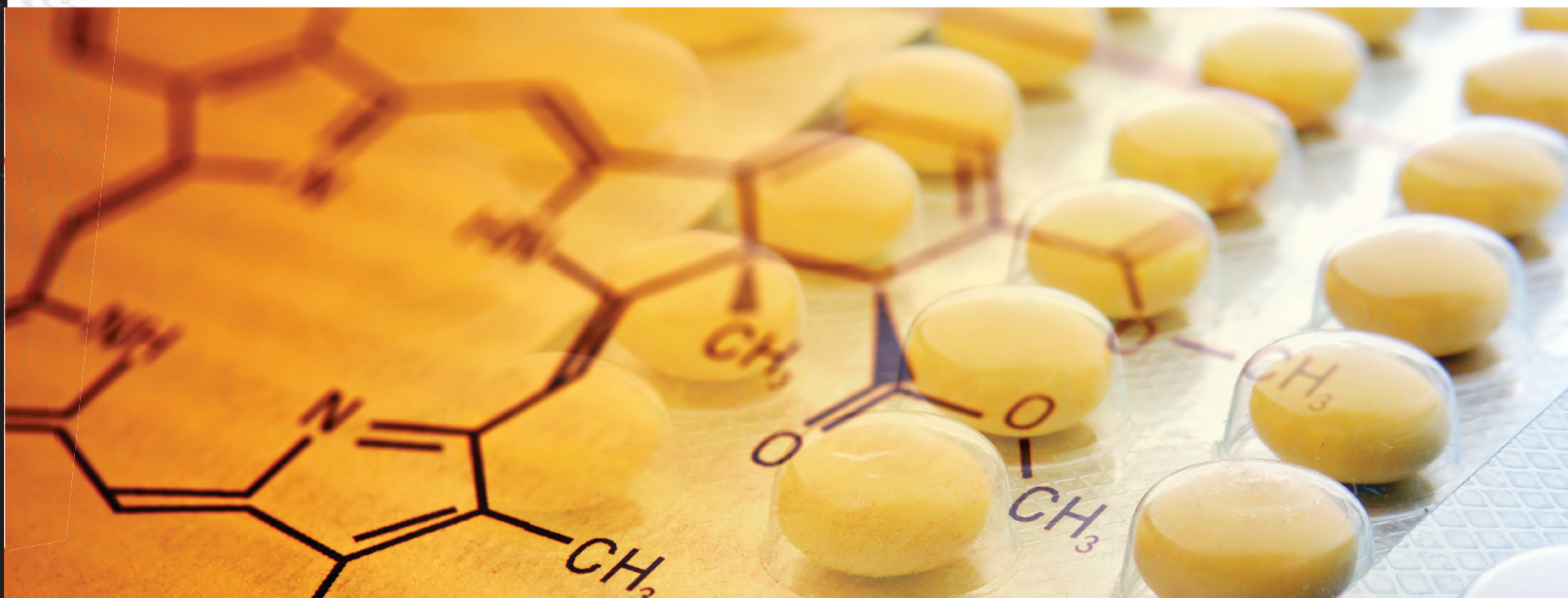
Michelle Giglio, PhD and Florian Fricke, PhD, both IGS faculty, co-led a workshop on “Do-it-yourself Microbial Genome Sequence Analysis” at the American Society for Microbiology’s annual meeting in Denver on Saturday, May 18th. The workshop introduced scientists to basic genome sequence analysis and used freely available bioinformatics resources, such as the open access **CloVR** tool for automated sequence analysis pipelines and the **DIAG** compute cloud for large-scale data processing. **More about the popular IGS Genomics Workshop**

DR. RAVEL CO-EDITOR OF NEW JOURNAL ON MICROBIOME RESEARCH

Jacques Ravel, Associate Director, Genomics at IGS and Eric Wommack, from the University of Delaware, are the Editors-in-Chief of ***Microbiome***, a BioMed Central (BMC) publication, which launched early in 2013. The new publication reflects the growing importance of the need for studying communities of microorganisms – microbiomes – and their function in their natural environment whether that environment is the human body, the ocean, or any other habitat.

SPOTLIGHT

ON POSTDOCTORAL FELLOWS & RESEARCH STAFF



YANG SONG, PhD

Advisor: W. Florian Fricke, PhD

My current research focuses on the study of microbiota manipulations of *Clostridium difficile* infected patient before and after fecal transplantation by using genomic and bioinformatics approaches. I am also involved in studying innate immune response through TLR9 activation triggered by specific genomic DNA.

Meanwhile, I contribute to the construction of diagnostic database-Micro_DX, which is a part of the CloVR project. Micro_DX includes the genomic information about antibiotic resistance and differentiation of typhi, or non-typhi Salmonella. My PhD dissertation is about the mechanisms of antibiotic action and antibiotic resistance in *Staphylococcus aureus*.



TRACY HAZEN, PhD

Advisor: David Rasko, PhD

My research focus in the Rasko Lab has been to investigate the diversity and evolution of pathogenesis of the enteropathogenic *E. coli* (EPEC), which are a leading cause of diarrheal illness among children worldwide. We have been using both comparative genomics and transcriptomics to understand the diversity of the pathogenic mechanisms and virulence gene regulation of EPEC.

In collaboration with Dr. Kristie Johnson (Department of Pathology) and Dr. Anthony Harris (Department of Epidemiology and Public Health) at the University of Maryland, Baltimore, we have been characterizing the sequence of multidrug resistance plasmids that are present in *E. coli* and *Klebsiella*. An ongoing part of this collaboration is studying the genomic diversity and antibiotic resistance of *Acinetobacter baumannii* through the **GSCID program**.



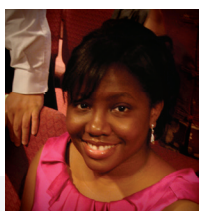
JAMES MUNRO, PhD

Advisor: Joana C. Silva, PhD

The common copepod, *Eurytemora affinis*, is an introduced euryhaline species, a recent invader of fresh water bodies in North America, and documented vector of waterborne diseases. In addition to a wide range of non-pathogenic taxa, the microbiome associated with these organisms is known to include disease agents such as those that cause Typhoid fever, shigellosis, and numerous diarrheal diseases such as cholera. The focus of my research is the assembly and investigation of the *E. affinis* transcriptome and sexually-biased, differentially expressed genes.

SPOTLIGHT

ON POSTDOCTORAL FELLOWS & RESEARCH STAFF



VONETTA EDWARDS, PhD

Advisor: Jacques Ravel, PhD

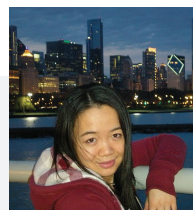
My research focuses on characterizing the role of the vaginal microbiota in vaginal health, specifically in protecting against sexually transmitted infections such as *Chlamydia trachomatis*. I focus on the cellular, molecular and immunologic responses of the host cells to the presence of different species and strains of *Lactobacillus* in the absence or presence of a STI agent. This is being accomplished using a human vaginal cell line 3D organotypic in vitro model that I have developed. We will establish correlation between strain phenotypes (biofilm formation, ability to disrupt biofilm, antibiotic production, lactate production), genotypes (genome sequence) and their ability to protect the vaginal epithelium.



ANNE ESTES, PhD

Advisor: Julie Dunning Hotopp, PhD

I am interested in how host-bacterial interactions drive adaptive diversifications of both partners. My research at IGS is focused on the taxonomic and functional differences in the microbiome of the bull-headed dung beetle, *Onthophagus Taurus*, across different life stages and populations.



BING MA, PhD

Advisor: Jacques Ravel, PhD

My research interests focus in understanding the relationships between the vaginal microbial community with the human host and how these mutually beneficial associations impact health and disease. The vaginal ecosystem is continuously experiencing external disturbances that are either temporary or lead to various vaginal conditions such as bacterial vaginosis (BV) or sexually transmitted infections (STIs), depending on the capability of the microbial community to resist change, or the level of community stability. I am interested in the temporal dynamics of community members of the vaginal ecosystem, as well as its functional output, which can contribute to what truly constitutes health and the normal status of the ecosystem.



GRADUATING POST-DOCTORAL STUDENTS: ANNA SEEKATZ, PHD

Advisor: Claire Fraser, PhD

As part of Claire Fraser's lab, I looked at the gut microbiota in cynomolgus macaques. My project specifically concentrated on identifying changes in the gut microbiota following live-attenuated *Shigella* vaccines and during wild-type *Shigella* infection. Interestingly, we observed differences in the gut microbiota of cynomolgus macaques from different geographic areas, which were correlated to differences in the clinical response to *Shigella*. In contrast to cynomolgus macaques from other regions, Mauritian cynomolgus macaques expressed a different microbiota community structure and were not susceptible to wild-type *Shigella* infection independent of their immune response. These observations highlight the importance of the possible protective role of the microbiota against enteric pathogens and consideration of host genetics in vaccine development.

Currently, I am a postdoc in Dr. Vince Young's lab at the University of Michigan. My research concentrates on *Clostridium difficile* infection and the microbiota in both humans and animal models.

RESEARCH HIGHLIGHTS

CONGRATULATIONS TO JACQUES RAVEL ON BEING ELECTED TO FELLOWSHIP IN THE AMERICAN ACADEMY OF MICROBIOLOGY

Jacques Ravel, Associate Director, Genomics at IGS and Professor, Microbiology and Immunology at the UM School of Medicine, was elected to the 2013 AAM Fellows. This is a very prestigious honor and a reflection of significant research contributions to the field of microbiology. **More**



Jeffery F. Miller, PhD, president of ASM (left) congratulates Jacques Ravel, PhD (right)



*Julie Hotopp, PhD
Assistant Professor
Microbiology and Immunology
UM School of Medicine*

IGS RESEARCHERS FIND BACTERIAL DNA MAY INTEGRATE INTO HUMAN GENOME MORE READILY IN TUMOR TISSUE

Gene Transfer May Play Role in Cancer and Other Diseases Associated With DNA Damage

Bacterial DNA may integrate into the human genome more readily in tumors than in normal human tissue, according to a new study from University of Maryland School of Medicine's Institute for Genome Sciences. Researchers analyzed genomic sequencing data available from the Human Genome Project, the 1,000 Genomes Project and The Cancer Genome Atlas (TCGA). They considered the phenomenon of lateral gene transfer (LGT), the transmission of genetic material between organisms in the absence of sex...**More**



UM INSTITUTE FOR GENOME SCIENCES AND CENTER FOR VACCINE DEVELOPMENT FIND THAT GUT BACTERIA PLAY KEY ROLE IN VACCINATION

Interdisciplinary teams of experts applied advanced genomic analysis and immunological techniques to examine the interplay between microbiota and *Salmonella typhi* and Shigella infections and vaccines.

The bacteria that live in the human gut may play an important role in immune response to vaccines and infection by wild-type enteric organisms, according to two recent studies resulting from a collaborative effort between the University of Maryland School of Medicine Institute for Genome Sciences and the Center for Vaccine Development. **More**

THE GENOMICS RESOURCE CENTER (GRC): A HIGH-THROUGHPUT SEQUENCING & ANALYSIS CENTER

The GRC supports the scientific programs of IGS and its collaborators, as well as researchers on the UMB campus and across the globe. The rapidly expanding and evolving array of sequencing platforms are enabling new questions to be asked in both basic and clinical research. Our team has been a leader in genomic technology development and sequence analysis for the past 20 years. We work with scientists and physicians across many different disciplines, and we have the experience to guide each project to the most efficient and optimal selection of sequencing and analysis platforms.

Recently, we launched **a blog** to share updates about our center and capabilities. We welcome your input and participation. We'll be sharing highlights of new platforms and applications, and featuring members of our team in upcoming issues. Please feel free to **contact us** with any questions about our sequencing & analysis services.



STEM



Joana Carneiro da Silva, PhD demonstrates DNA strand challenge at STEM event

EDUCATIONAL OUTREACH

IGS is actively involved with Science Technology Engineering and Mathematics (STEM) outreach – sponsoring interns, speaking to school groups and partnering with other organizations committed to promoting science education. In May 2013, IGS volunteers led by Michelle Giglio, PhD and Joana Carneiro da Silva, PhD, provided two hands-on activities at a science fair for Baltimore City school students hosted here in the BioPark. For one of the activities, the curious kids used pipe cleaners to build models of DNA and then decoded the sequence. For the other activity, the children assembled “cells”, using plastic bags as membranes and various craft items representing the organelles. Throughout the visit, IGS volunteers talked to the children about the fun and importance of science and research.

In June, Dr. Giglio participated in a morning of “genomics immersion” for a group of high school science teachers. The event included a presentation on genomics, hands-on exercises, and a panel discussion with information about useful resources.

More about IGS STEM initiatives

PLEASE KEEP IN TOUCH

Do you have questions about our research or our services? Are there topics you'd like to see featured in upcoming issues?

Please let us know your feedback. Send to spick@som.umaryland.edu.

For donations to our research, please contact Patricia Bates at pbates@som.umaryland.edu.



THANK YOU!