Research News

Jake Tu’s lab breaking new ground on Vector-Borne Disease

With the outbreak of vector-borne diseases like Zika, chikungunya, and dengue on the rise, public health officials are desperate to stop transmission.

Jake Tu’s lab is exploring one way to combat this—through the genetic engineering of mosquitoes to maleness. In their recent publication in *Science*, the Tu lab used CRISPR-Cas9 gene editing technology to silence a male sex determining gene called Nix. This could be a winning combination for tipping the male-female mosquito ratio in the wild, since only female mosquitoes need to feed on blood in order to produce eggs, and are solely responsible for disease transmission. The Tu lab has shown that adding Nix in female mosquito embryos can initiate male development. The lab has also been collaborating with Igor and Maria Sharakhova.

Zika Virus

Jake Tu, along with Entomologists Igor and Maria Sharakhova were featured in a recent New York Times article detailing how scientific experts are collaborating to understand and combat the Zika virus worldwide.
More Research News

to sequence the mosquito Y chromosome—the genetic driver of sex-determination and male fertility. The findings, published in the Proceedings of the National Academy of Sciences will inform a variety of genetically based mosquito control strategies that focus on creating more males than females.

"Thirteen years after the publication of a draft genome of the Anopheles gambiae mosquito, we've finally characterized its Y chromosome," commented Tu. "This is one of the last pieces of the puzzle. Having the Y will help us figure out the genetic basis of male biology in future studies."

"The Y chromosome had previously not been characterized because it mostly consists of repetitive DNA sequences that stump the algorithms used by computers to assemble the mosquito's entire genetic make-up," commented Brantley Hall of Christiansburg, Va. Brantley recently completed his PhD in the Tu lab and was first author on the Science paper, and co-author on the PNAS paper.

Gender and Mosquitos

Male mosquitoes do not bite and are harmless to humans, while female mosquitoes bite humans to get the blood they need for egg production. The new information about the Y chromosome will facilitate efforts to reduce female mosquitoes or create sterile males—strategies of interest to research teams across the world.

Tu and Sharakhova used a new long single-molecule sequencing technology, a new bioinformatics algorithm specifically designed to identify Y sequences, and physical mapping of DNA directly to the Y chromosome to nail down the Y chromosome sequences. This collaborative study provides a long-awaited foundation for studying mosquito Y chromosome biology and evolution.

Retired Faculty Spotlight

Dr. Jiann-Shin Chen, Professor Emeritus of Biochemistry, and wife, Kathy, enjoy walking and hiking. They are shown enjoying life on one of the hiking trails they recently visited around the Durham/Chapel Hill area. Dr. Chen retired from the department of Biochemistry in June 2010. Kathy stays busy, working in the Department of Biological Sciences at Virginia Tech.

Retired Faculty and staff from the Department of Biochemistry: we would love to hear from you!
New Academic Support Advisor

The Department welcomed David Lally, our new Academic Support Advisor, who started in February 2016. Mr. Lally will help advise undergraduates and provide data and resources to increase student success in Biochemistry.

Ut Prosim

Many of you know that the Virginia Tech population gives back to the community and world in several ways. Our annual “Big Event” is a day when the majority of undergraduate students donate their time to help with community projects. The students of the Virginia Tech Biochemistry Club were out and about feeling the spirit of Ut Prosim this spring. Every Friday, biochemistry students visit Prices Fork and Kipps Elementary Schools and lead an after-school program called “Science Club.” Each week they do a science experiment to show younger students the joy behind science. On April 9, club members joined over 10,000 volunteers in The Big Event at Virginia Tech. This student-run community service event engages students, staff, and faculty with communities throughout Blacksburg, Christiansburg, and the New River Valley as a way of saying “thank you.”
Outstanding Students

The College of Agriculture and Life Sciences (CALS) recently named its 2016 Outstanding Seniors who are recognized for their academic achievements, leadership, and experiences beyond traditional course work. Shown in the group above is Morgan Simpson, Outstanding Biochemistry Graduating Senior, and Emma Helm, Outstanding Senior in Animal and Poultry Sciences and daughter of Professor Richard Helm of Biochemistry.

While working towards her degree in biochemistry and a minor in chemistry, Morgan Simpson dedicated much of her time to research. She presented her research on infectious diseases at the Fralin Summer Undergraduate Research Symposium and the Drug Discovery Day Student Poster Session, and co-authored several publications. Morgan is also the recipient of the William E. Newton Scholarship, named for former department head, William Newton. After graduation, Morgan plans to continue conducting research, and ultimately wants to work at the CDC or USAMRIID.

Outstanding College of Science Student

As the department offers degrees in both CALS and the College of Science, we also have an outstanding student in the College of Science: Kimberly R. Van Dongen is from Merry Hill, NC. Kimberly completed her Biochemistry degree with a Chemistry minor. After graduation, she plans on attending medical school while continuing to be active in volunteer experiences.
Giving Highlights
The William B. Downey Scholarships are awarded to encourage biological and chemical research for undergraduate students in the Department of Biochemistry. They are made possible by a generous gift from the Downey family. These gifts can transform lives and lead to training experiences that positively impact our society. Please enjoy Matthew Nguyen and Reeder Robinson’s reflections on the importance of a Downey scholarship on their lives.

As an undergraduate, the path toward becoming a physician is often faced with many obstacles, not only academic, but also financial. Receiving the William B. Downey Scholarship went a long way in assisting me to achieve this aspiration because this honor showed me that someone believes in me enough to make a financial commitment on my behalf. I am now a medical student at Virginia Commonwealth University School of Medicine working toward this goal.

Sincerely, Matthew Nguyen

Receiving the Williams Burns Downey Memorial Scholarship my senior year as an undergraduate at Virginia Tech gave me encouragement to continue to pursue research in biochemistry and helped me decide to complete my Ph.D. at Virginia Tech. I am currently a postdoctoral scholar at the Medical University of South Carolina researching experimental therapeutics against Multiple Myeloma.

Reeder Robinson, Ph.D.
Virginia Tech 2015

Your gifts enable us to provide scholarships, travel support to scientific conferences, and new equipment for our instructional laboratories. Our 6 credit intensive major's lab class is especially in need of new equipment. This unique capstone course provides students with experiential learning and skills of incredible value.
Outstanding Graduate Students

Anne Brown from David Bevan’s lab defended her dissertation in March 2016 and was the recipient of the 2015 Virginia Tech Graduate School Graduate Student Service Excellence Award for her outreach to Alzheimer’s patients and families. Anne has studied the molecular mechanisms of Alzheimer’s disease, and encourages others to seek out their passion and engage with serving others. She states “It is absolutely crucial that when you reach out to start a project like mine that you are fulfilling a need in the community and listen to the communities perspectives and desires”.

Anne also received one of Virginia Tech’s Illuminator Awards for 2015.

Outstanding CALS Graduate Student

Phoebe Williams from Glenda Gillaspy’s lab defended her dissertation in October 2015 and was named the college’s outstanding doctoral student. Phoebe has been first author on research papers and organized an international meeting, the Gordon Research Seminar on Plant Lipids. Phoebe is now a Postdoctoral Fellow in the Gillaspy lab.

Outstanding Interdisciplinary Graduate Student

Brantley Hall from Jake Tu’s lab is the Outstanding Interdisciplinary Graduate Student of 2016. Brantley earned a PhD in Genetics, Bioinformatics and Computational Biology in May 2016; his work on mosquito sex determination was featured on page 1 of this newsletter. Brantley has started Postdoctoral work in Boston at the Broad Institute, associated with MIT and Harvard.
The department welcomes your thoughts on this newsletter. Please send your thoughts, pictures, news, updates etc. to Ms. Zerita Montgomery at zerita@vt.edu. If you would like to receive this newsletter electronically, please send your email address to Ms. Montgomery. If you are a CALS alumni you will receive a CALS newsletter with a link to the Biochemistry newsletter at the end of the document. We plan to distribute this newsletter four times a year.

Research Scientists, Postdoctoral Fellows and Visiting Scholars:

Heba Abdelwahab, James Biedler, Seema Dalal, Julia Sanchez Martin del Campo, Haitham Elaadli, Maria Fernandez-Murga Chavanne, Ruth Irwin, Pengcheng Liu, Marika Mehnert, Fernando Merino, Katherine Phillips, Endang Purwantini, Yumin Qi, Amy Rasor, Keith Ray, David Ruggio, Dwi Susanti, Phoebe Williams, Ling Wu, Yang Wu

Graduate Students:

Tahmina Ahmed
Anne Brown
Kendra Bufkin
Michael Casasanta
Brantley Hall AEM
Rubayet Elahi
Amanda Fisher
Benedicta Forson
Xiaonan Fu
Xiaofang Jiang

Elizabeth Kowalski
Jing Liang
Mynor Medrano
Danielle Miller
Reyhaneh Ojani
Blake Sanders
AnaLisa Valenciano
Paul Velander
Jiun Yen
Lu Zhai