

MT INBRE Spotlight

Shavonn Whiten

First in Family to Publish Major Research Paper, Pursue Ph.D.

It was the summer of 2012, and Shavonn Whiten had just moved to Bozeman, Montana, to work on an invasive species project with the US Geological Survey (USGS) Northern Rocky Mountain Science Center. Upon moving, the Baton Rouge, Louisiana, native recalls having to adjust quickly to life in Montana. Shavonn had just returned from a research trip in Ghana, Africa, and, until then, had never ventured very far outside of Louisiana for extended periods of time. Ghana is long ways from Baton Rouge, but Shavonn was surprised to have experienced greater culture shock upon moving to Montana than during her time in Africa. According to Shavonn, “Ghana was a completely different country, and having just experienced international travel, I didn’t think that moving to a different part of the US would require much adjustment, but it did.”



Part of the adjustment was learning to navigate in an environment that was statistically less than one percent African-America. “In Montana, I learned to see an individual for their inner attributes, and could no longer use outer appearance as a shortcut to define my support system,” said Shavonn. “I had to get past the color barrier, quickly realize that we all have qualities in common, and use that realization to identify people who I could empathize with and who could empathize with me. Outside of my research, living in Montana helped me become more confident in what I had to offer as an individual.”

Meanwhile, Shavonn’s job with USGS also required that she continue her education by taking science classes related to her work. Shavonn isn’t a person who’s easily deterred, and she set about to make the most of the opportunity to

“Never forget the path you walked to reach your academic goals. Your students are your future and will carry on your scientific legacy.”

EMERGING LEADER

When not in the lab, Shavonn enjoys volunteering in underserved communities, salsa dancing, and learning about different cultures.

She aspires to serve as a mentor and positive role model for future scientists – especially for minority youth who aspire to careers in science.

Shavonn says that she was “blessed to have wonderful mentors who provided sound advice, words of encouragement during tough times and who were truly invested in my success as a scientist and, more importantly, as a human being.”

Shavonn has already begun this important work, having taught at MSU Extended University’s Peaks and Potentials enrichment summer camps for grade-school students.



study at Montana State University (MSU). As luck would have it, during Spring semester 2012 Shavonn was introduced to professor Robert Peterson, Ph.D. She quickly shared her interests and career goals with Dr. Peterson. It was in that moment, on the MSU-Bozeman campus, that their individual stories began to intertwine.

Professor Peterson – or “Bob” as his students frequently call him – is an entomology professor at MSU who specializes in biological risk assessment with particular emphases in biotechnology, invasive species, and pesticides. Bob is known around campus as an enthusiastic teacher with a knack for organizing interdisciplinary research projects and a strong commitment to furthering online learning opportunities.

During their initial conversation, Shavonn found interest in the research Bob’s laboratory conducted. Growing up in Louisiana, she was very familiar with mosquitoes. In addition, her recent travels to Ghana solidified her interest in a career centered on public health and mosquito control. It wasn’t long before Shavonn approached Bob about beginning a master’s degree in entomology at MSU.

Bob was impressed by Shavonn’s genuine interest and potential as a researcher, but he didn’t have a readymade project that encompassed Shavonn’s interests or, for that matter, funding to take on another graduate student. Sensing Shavonn’s potential, Bob approached Allen Harmsen, Ph.D., and Ann Bertagnolli, Ph.D., from the Montana IDEa Network of Biomedical Research Excellence (INBRE) as well as administrators from the Montana Experimental Program to Stimulate Competitive Research (EPSCoR) – both MSU-housed federal programs that support minority graduate students pursuing

STEM fields of study. After meeting, Allen and Ann were preliminarily onboard with helping fund Shavonn, but the plan hinged on finding an area of inquiry that matched Shavonn’s interests and fit within INBRE’s and EPSCoR’s mandates.

SERENDIPITY STRIKES

The answer to the research-topic question came while Bob’s attention was turned elsewhere. While busy writing a chapter for an unrelated academic text, Bob was suddenly

immature insects as opposed to adult mosquitoes – a key distinction that will come into play shortly.

Despite the topic’s relative obscurity, the relationship between temperature and pesticide toxicity is an important phenomenon to consider – especially in a world with a warming climate. If, for example, pesticide control of mosquito-carried pathogens was to become less effective due to rising temperatures, the total population and habitat range of mosquitoes



Shavonn Whiten undertaking the role of scientific mentor at MSU’s Peaks and Potentials Summer Camp

reminded of a relatively obscure phenomenon with significant, yet underexplored implications. The research itself is fairly technical, but the basics are easy to understand.

Quietly over the past 30 years, a handful of researchers observed and cataloged how changes in outside temperature can impact certain pesticides’ ability to kill insects. Pausing momentarily from his writing, Bob realized that this body of research was, on the whole, persuasive and significant, albeit somewhat incomplete. For example, many of the prior experiments were conducted on aquatic or

could stand to rise. In addition to representing a fascinating set of entomological research questions, this line of reasoning also suggests major implications for global public health in coming decades.

Shavonn and her growing interest in toxicology, immunology, infectious disease, and public health immediately jumped to Bob’s mind as the person to carry out this research. According to him, “this was important work that needed to be done and done well. Shavonn was the perfect person to take it on.”





Shavonn conducts laboratory research at Montana State University

THE RESEARCH

Shavonn's research both confirmed and expanded on previous studies. Through precisely controlled laboratory experiments, Shavonn verified that increasing ambient temperature does indeed alter the toxicity of certain pesticides (Type-1 pyrethroids to be exact) for certain mosquitoes (*Aedes aegypti*). As is often the case in science, a close examination of the underlying dataset tells a more nuanced story, but the take-home message in this case remains the same: Higher ambient temperatures may mean less effective mosquito control.

One way that Shavonn's research parted from many of her predecessors is that it systematically focused on adult mosquitoes as opposed to more immature insect development stages. From a public health perspective, this is significant because adult mosquitoes, not their eggs, larva or pupa, are the vehicles for the transmission of pathogens that cause diseases like dengue, chikungunya, and yellow fever. By using adult mosquitoes for her experiments, Shavonn ensured that her data would

be relevant to future discussions involving common control strategies that attempt to suppress disease-causing pathogens by disabling their main avenue of transmission.

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According to Bob, “Shavonn's findings have absolutely helped solidify and refine our understanding of temperature's effect on insect control, but they've more importantly generated important questions for follow-up research.” Chief among those follow-up questions includes deepening our understanding of how Shavonn's findings dovetail with the much larger, global story of climate change.

Recall those early baseline studies establishing temperature as a key variable in pesticide efficacy. Significantly, most of these studies were published before the details of human-caused climate change were broadly understood. “Today there are few left who dispute that earth's

climate has warmed significantly over the past century, and best of luck finding one who's a respected climatologist,” said Bob. Though doing so may flirt with speculation, it's difficult to avoid connecting the dots linking Shavonn's findings to observable climatic trends and plausible future scenarios.

Today, the generally accepted consensus among climatologists is to expect somewhere between a 1 and 3.5 degree Celsius increase in the annual mean surface temperature by the year 2100. For those of us using Fahrenheit thermometers, that's approximately 2 to 6 F of anticipated warming. Significantly, and for reasons outside of the scope of this article, this anticipated warming is likely to be most prevalent during evening hours—precisely the time of day in which adult mosquitoes tend to be most active and most susceptible to traditional pesticide application strategies.

“We're not in a place to make absolute predictions, but we need to look at the facts and trends with eyes wide open,” said professor Peterson. “We have mosquitoes in the environment, and clearly some of those mosquitoes carry pathogens that can cause disease. People use pesticides to control mosquito populations to prevent disease. Since it's been verified that rising temperatures can affect certain pesticides' ability to control mosquitoes, the public health implications of these findings deserve to be discussed within the larger climate change mitigation calculus.”

WILD DREAMS COME TRUE

Whether the findings from her first published paper reach a larger audience or contribute to the ongoing discussion regarding climate





Aedes aegypti

change remains to be seen. One thing is for certain: this isn't the last you'll hear of Shavonn Whiten.

Currently Shavonn is a second year doctoral student at the Virginia Polytechnic Institute and State University (Virginia Tech) Department of Entomology. According to Shavonn, "my current research here at Virginia Tech is very rewarding and unique. I have the awesome opportunity to learn from one of the top vector biologists today, Dr. Zach Adelman. Daily I see myself achieving and conducting scientific research I never in my wildest dreams thought possible."

Those wild dreams now include work on cutting-edge genome editing applications. Shavonn says that her Ph.D. project focuses on "the identification and characterization of adult *Aedes aegypti* peritrophic matrix proteome with specific interest in potential heme-binding peritrophins." In laymen's terms, she plans to investigate whether state-of-the-art genome-editing techniques such as CRISPR/Cas 9 have the potential to control the *Aedes aegypti* mosquito.

Again we speculate, but perhaps, one day, Shavonn's work may even lead to discoveries that ultimately decrease the amount of pesticides used to suppress mosquito-transmitted diseases or perhaps eliminate the need for pesticides altogether. We are now,

after all, dancing in a realm where wild dreams come true, so let's take Shavonn's lead and allow ourselves a moment to be curious and wonder.

GRATITUDE

While Shavonn has certainly earned all the praise she is receiving for her work, she is quick to express gratitude for those who helped her. "This is a big accomplishment for me, as I am the first person in my family to publish in a major journal and more specifically to pursue a PhD. It was often difficult to tread unfamiliar territory. However, I was blessed to have many mentors and role models who provided positive advice during the process."

INBRE provided the platform for me to network, present my scientific research, and conduct my research without worrying about outside jobs. I was blessed to meet awesome folks like Allen Harmsen, Ann Bertagnolli, Laurie Howell, and Valerie Holznagel - all ... played integral roles in my successful completion of my MS degree at MSU.

Shavonn credits her current PhD advisor, Dr. Adelman of Virginia Tech for investing in her success as a research scientist and for teaching her the techniques and skills necessary to be a competitive scientific researcher. She also credits Bob Peterson at MSU for getting her started in the field of entomology. "Without professor Peterson's support, I don't think I would have ever been introduced to entomology – a field that combines all of my interests," said Shavonn.

Shavonn is also grateful for the institutional and developmental support she received while

completing her master's degree at MSU. "During my time at MSU, I developed confidence in my ability as a research scientist, became an independent thinker, and learned how to navigate the publishing arena." According to Shavonn, "Montana INBRE provided the platform for me to network, present my scientific research, and to conduct my MS research without worrying about outside jobs. Through INBRE, I was blessed to meet awesome folks like Allen Harmsen, Ann Bertagnolli, Laurie Howell, and Valerie Holznagel – all of these INBRE folks were positive influences and played integral roles in my successful completion of my MS degree at MSU."

Shavonn also credits MSU EPSCoR, MSU LRES faculty and staff, East Baton Rouge Mosquito Abatement and Rodent Control district, Peterson's lab members, and "all of the wonderful friends and family I acquired during my time at MSU."

The list of people she's grateful for also includes her parents, Sherman and Gloria Whiten, and her personal mentor, Dr. Estralita Martin, who is the director of the NIH-supported Minority Health International Research Training (MHIRT) program. "Since my 2011 international research experience in Ghana, Africa," says Shavonn, "Dr. Martin has been my guiding light throughout pursuing my professional career. I am forever grateful for the time and energy she has and continues to invest in me." ■

The full text of Shavonn Whiten's first journal article can be found at: <http://jme.oxfordjournals.org/content/early/2015/10/16/jme.tjv159>

For an other article about Shavonn in *Entomology Today*, see <http://entomologytoday.org/2015/11/24/higher-temperatures-impair-efficacy-of-permethrin-insecticide/>

