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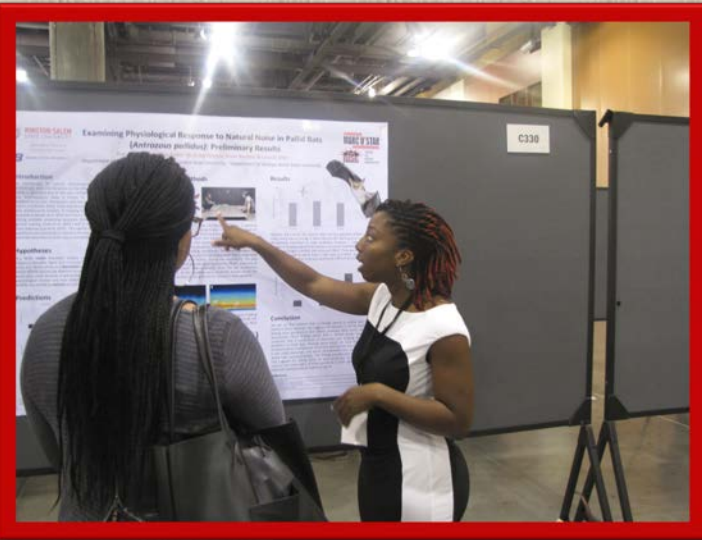
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Examining Physiological Response to Natural Noise in Pallid Bats (*Antrozous pallidus*): Preliminary Results

Kari Dawson*, Lakhia Fuller, Nickolay Kristov, Jesse Barber, & Louise Allen
 Department of Biological Sciences, Winston-Salem State University, *Department of Biology, Boise State University

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Introduction
 The soundscape of natural environments is often understudied. Contrasting data and literature on the effects of anthropogenic noise on wildlife is abundant due to the vast number of studies conducted in this area. Anthropogenic noise is known to substantially alter behavior, reproductive success, distribution, and the community structure of wildlife (Francis and Barber 2013). Three hypotheses have been proposed to explain noise avoidance by animals: 1) masking of important acoustic information (inward in Barber et al., 2010 and Francis and Barber 2013), 2) distraction, limiting available processing resources (independent of signal and noise spectral overlap; Chan et al. 2010) and 3) noise aversion mediated by a stress response (Lee et al. 2015). This opinion study aims to test these three hypotheses and specifically to examine the physiological/stress response (via heart rate telemetry) to both natural and spectrally shifted natural noise.

Materials & Methods
 Our study species is the pallid bat (*Antrozous pallidus*), a generalist insectivore. This species relies on preprogrammed cues for foraging and is sensitive to noise. During training, a foraging arena was placed in the center of a carpeted, foam-lined flight room. The arena housed 14 mesh speakers, and a single working speaker. The working speaker and the other non-working speakers were randomly placed on the arena. The working speaker emitted playbacks of insect wing movements. The control speakers had meowhorn replicates placed on top and the working speaker had a single dead meowhorn replica instead of a replica. During the experiment, the bats were exposed to one spectral and two noise treatments. "Spectral" playbacks at full spectrum and "shifted" noise playbacks. Once the bat successfully retrieved it's reward, all the speakers were randomly moved across the arena to a different location on the grid and the process is then repeated.

Results
 Between the control, the natural noise and the spectrally shifted natural noise, there was no change in heart rate ($p=0.075$). We found no support for the aversion hypothesis of noise avoidance. However, Fuller found an increase in foraging search time between the sound treatments. Search time was 6 times longer in shifted noise noise ($p<0.0001$). There was a smaller but significant increase in search time in river noise ($p=0.0002$). Search time in natural and shifted river noise was significantly different ($p=0.02$).

Conclusion
 We did not find evidence that introduced natural or shifted river noise elicited a stress response. This suggests that aversion is not the mechanism driving noise avoidance in this species. However, these results alone are inconclusive. These findings, paired with Fuller's results, lead to the conclusion that a combination of distraction and masking drives noise avoidance in pallid bats. Masking alone would not have resulted in an increased search time between the control and the river noise condition if it was solely distraction, the search time between river and shifted river would have increased equally. This finding provides preliminary evidence that suggests the driving force of noise avoidance. Future studies will examine the mechanisms of noise avoidance in other species of bats and birds with varying levels of reliance on sound.

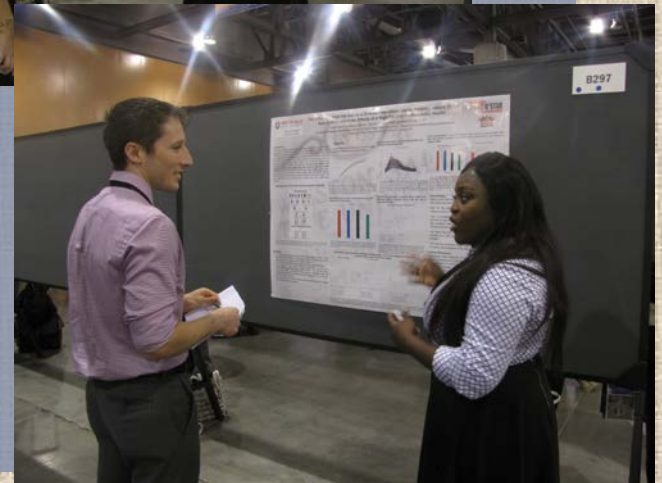
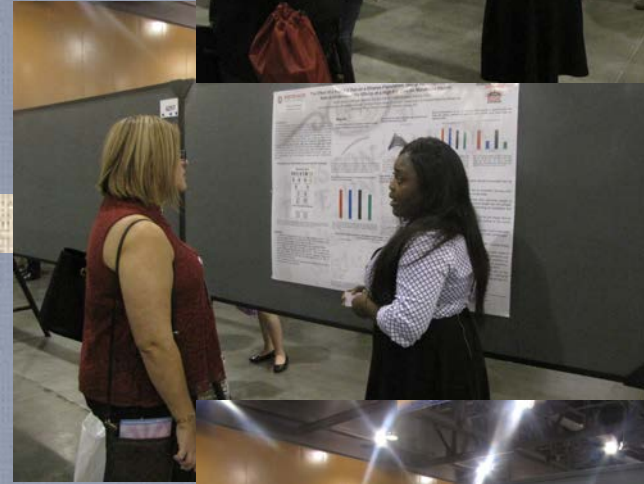
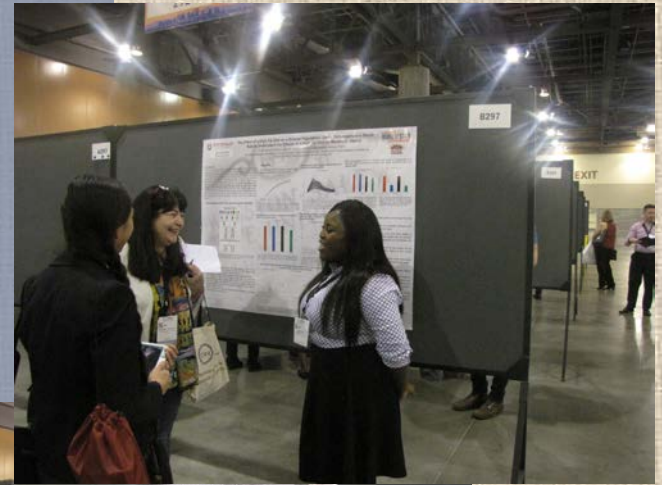
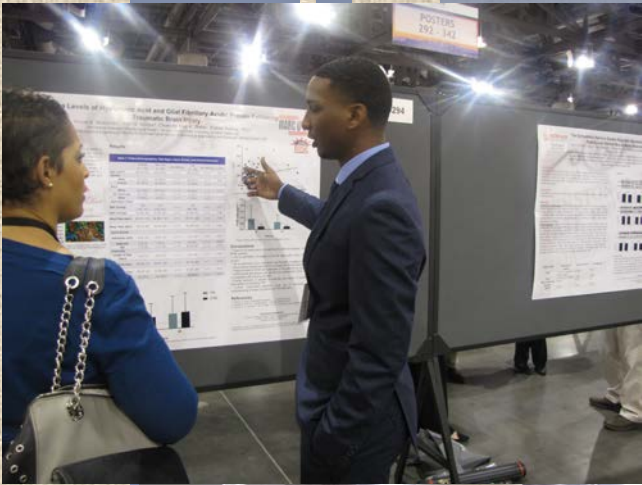
Predictions
 Natural (S) and shifted river (R) search will allow us to distinguish masking from the two other hypotheses. We predict that shifted river sounds will mask hearing in species listening for high-frequency (PF) signals (e.g. Pallid bats listening for insect wing sounds).

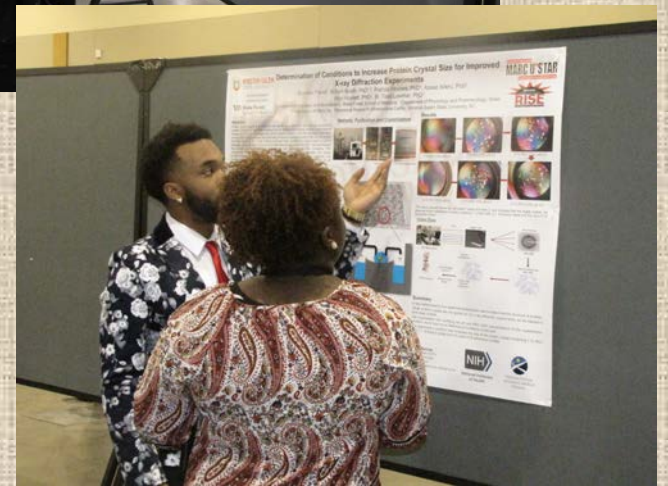
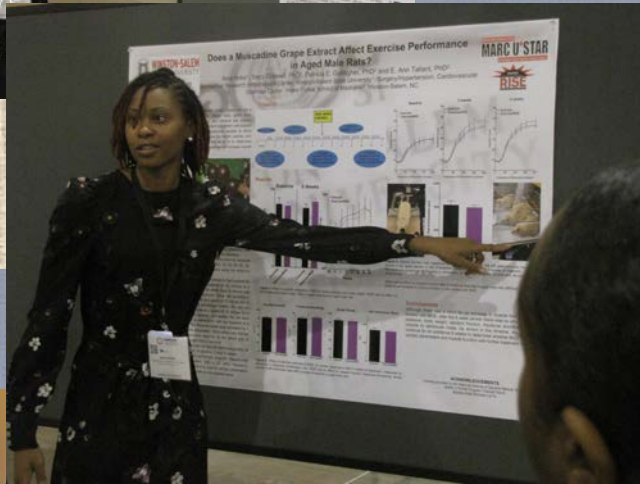
References
 Barber, J., Francis, C. D., & Croxall, J. F. (2010). Masking of echolocation calls by anthropogenic noise affects foraging success of a nocturnal insectivore. *Journal of Experimental Biology*, 233(18), 3365-3371.
 Chan, K. H., Nager, R. B., & Hildebrand, S. F. (2010). The effects of noise on the behavior of a nocturnal insectivore. *Journal of Experimental Biology*, 233(18), 3365-3371.
 Dawson, K., Fuller, L., Kristov, N., Barber, J., & Allen, L. (2015). Examining Physiological Response to Natural Noise in Pallid Bats (*Antrozous pallidus*): Preliminary Results. *Journal of Experimental Biology*, 233(18), 3365-3371.

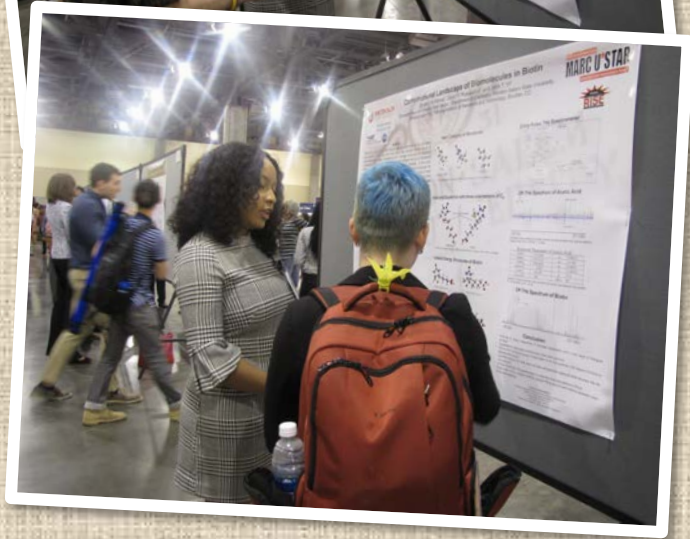
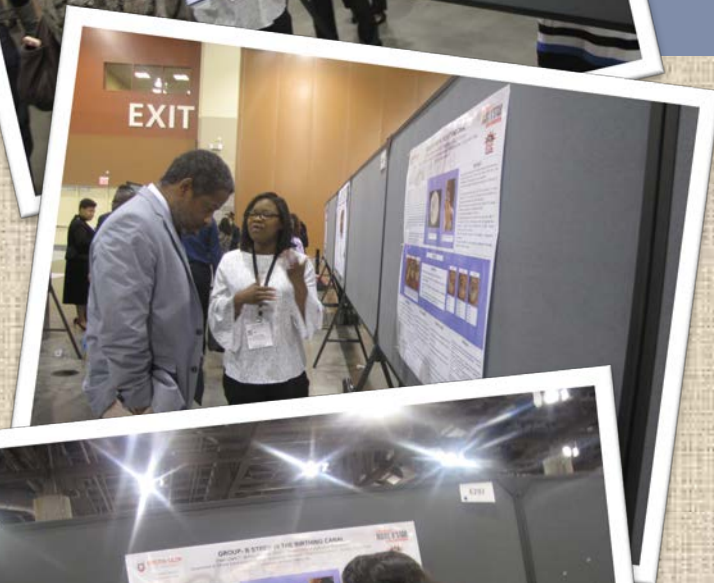
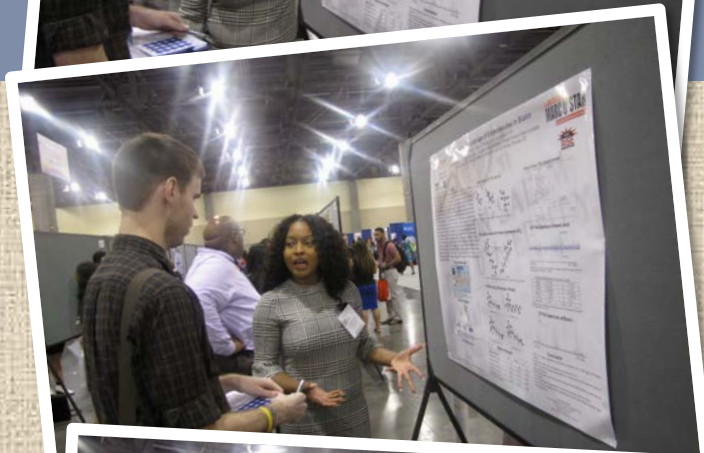
Lakhia Fuller is presenting the behavioral side of this work, specifically foraging behavior and search time results.

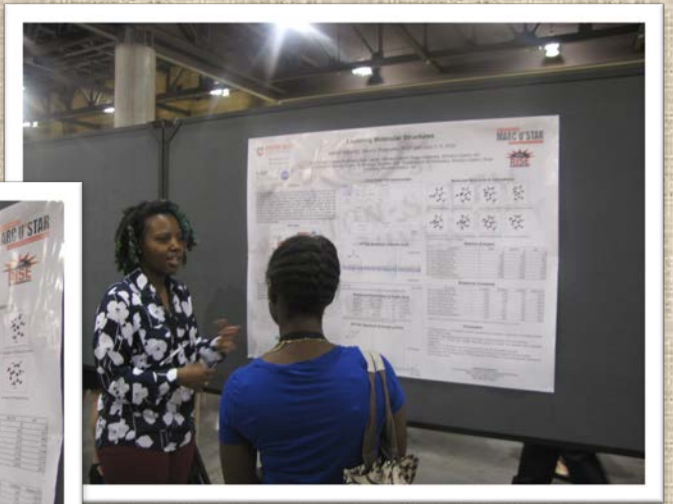
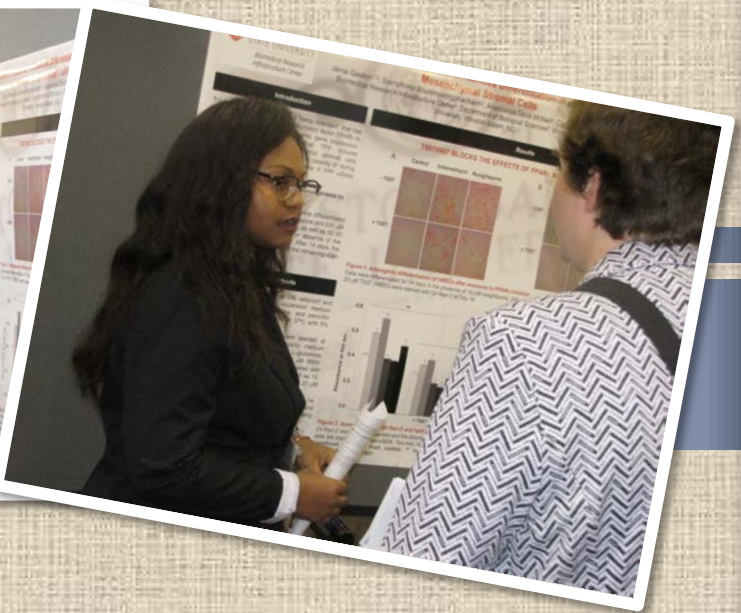
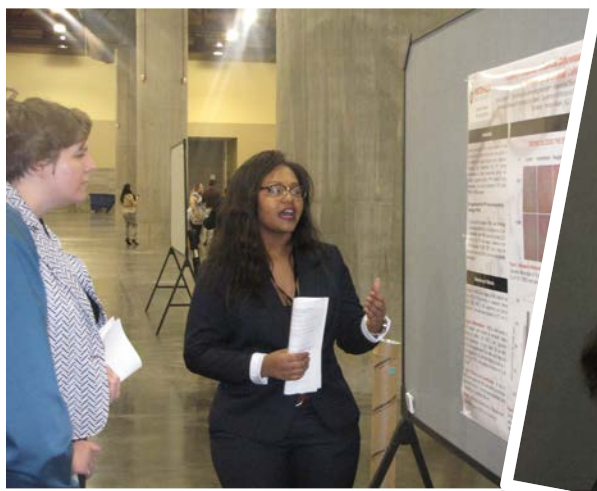
Best Poster Presentation Winner
 Kari Dawson
 Social and Behavioral Sciences and Public Health

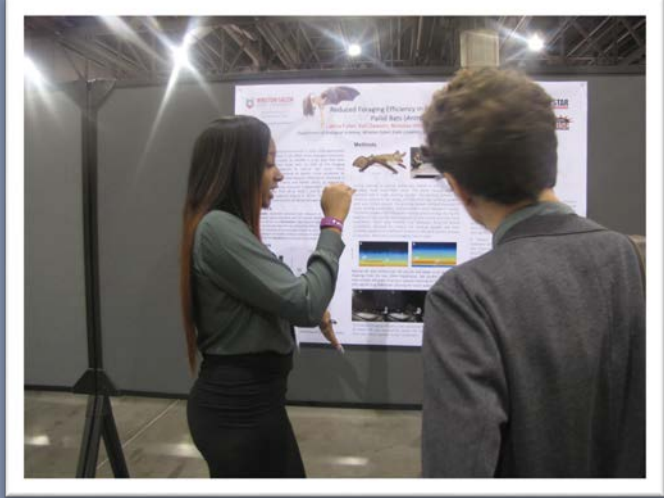
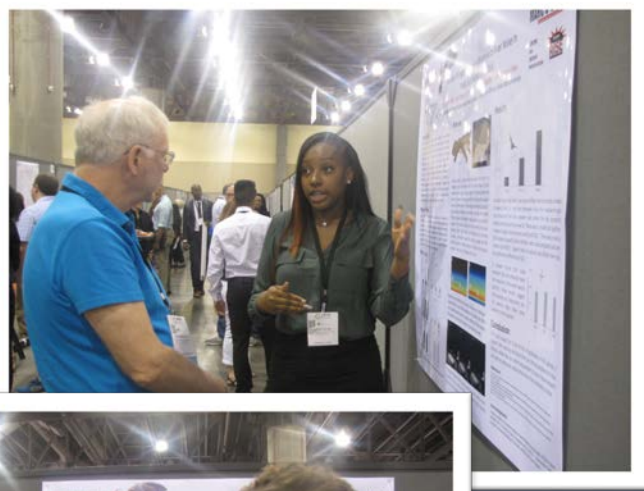
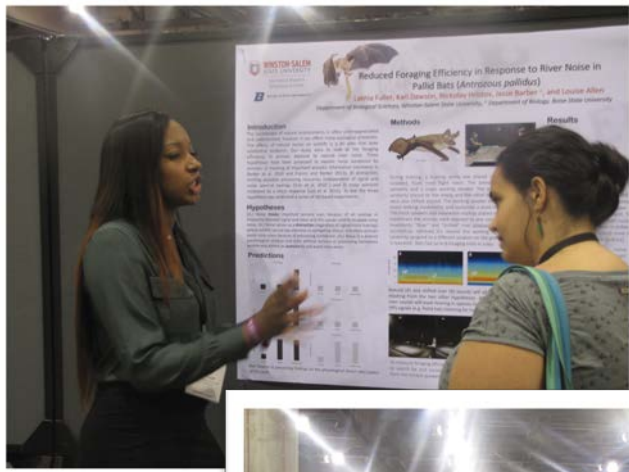


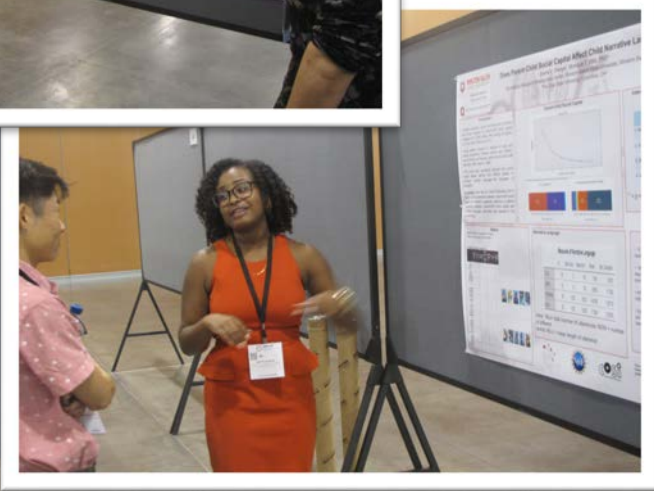
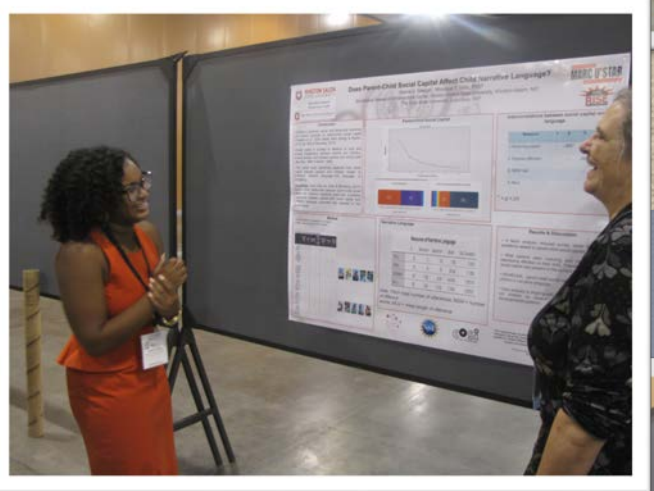
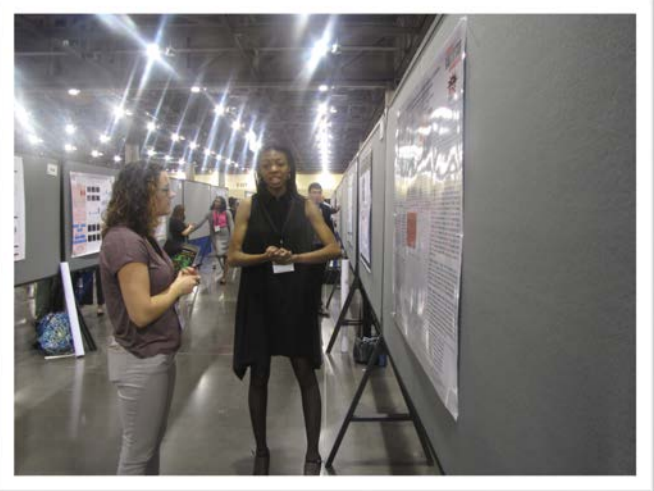


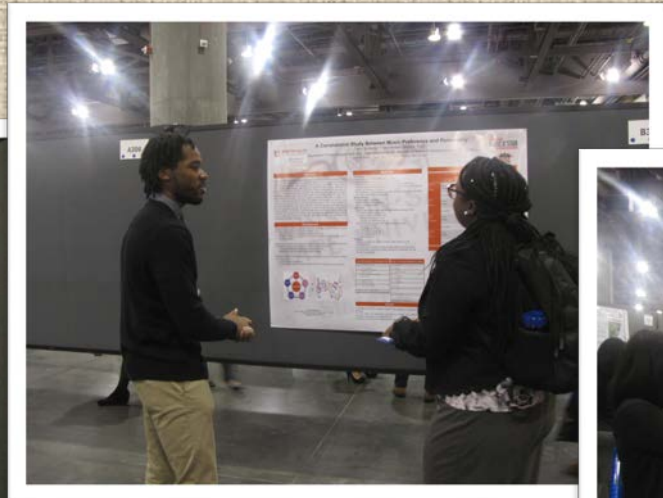
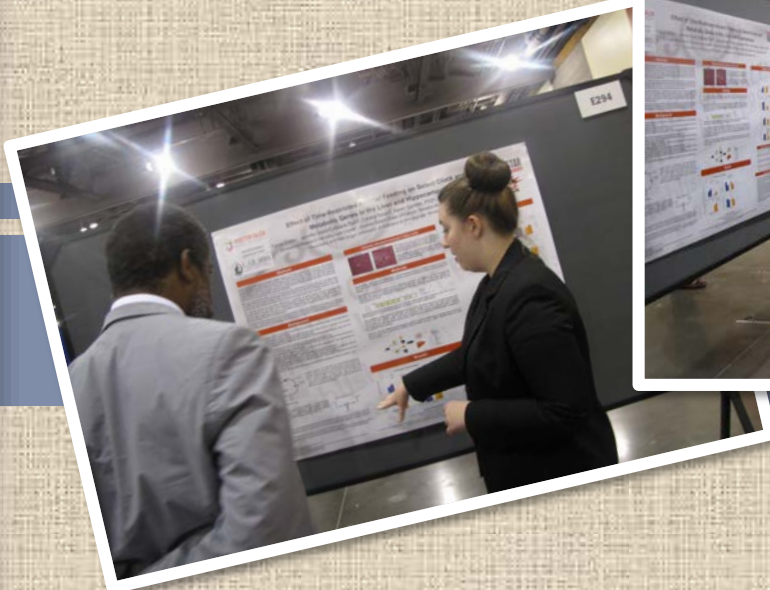


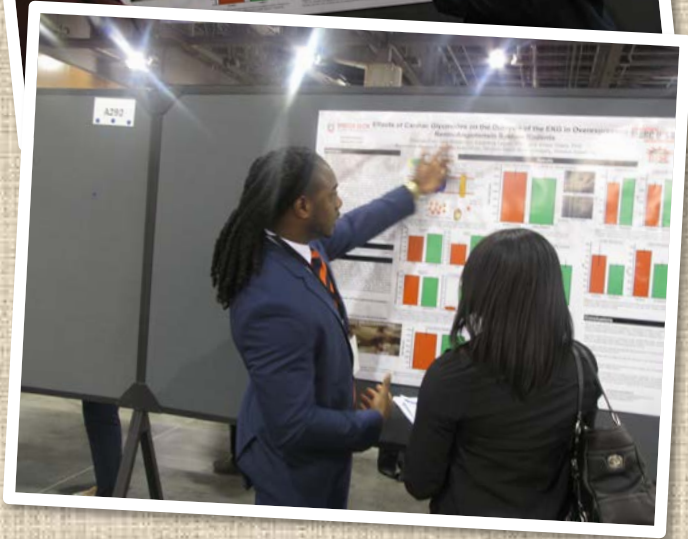
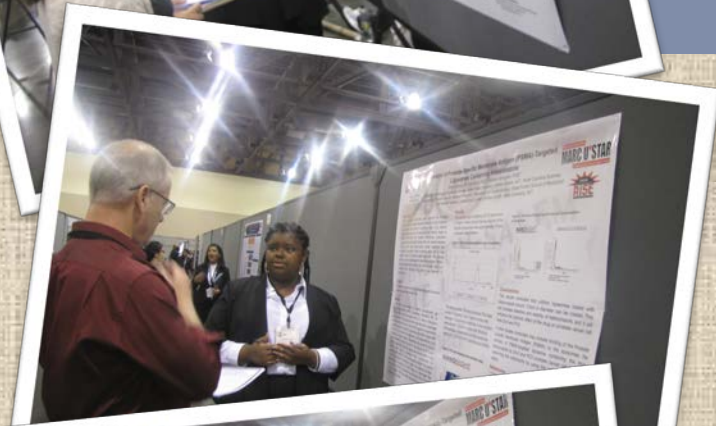
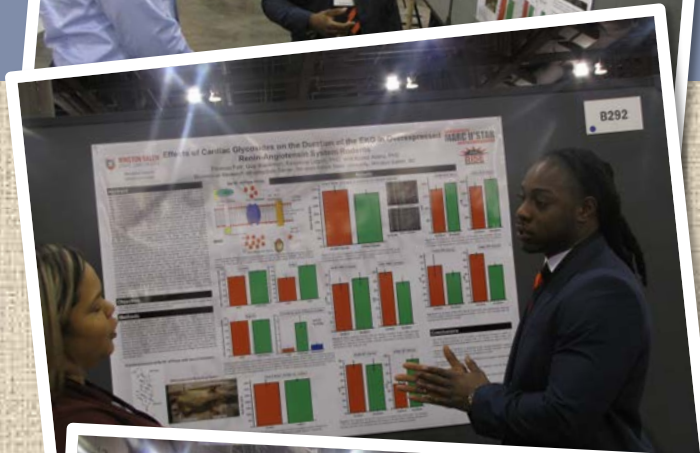
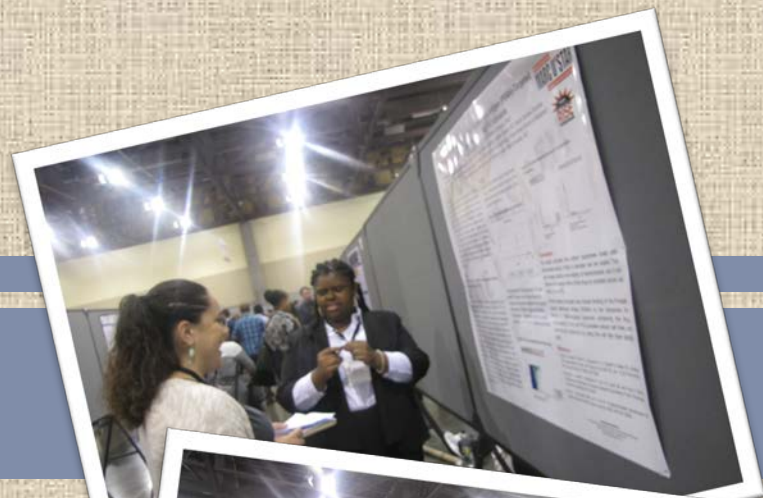


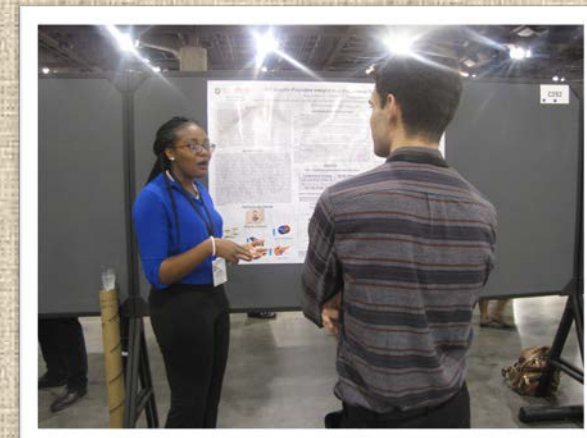
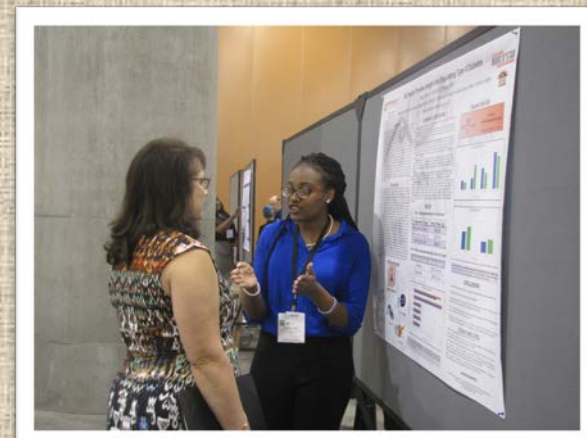
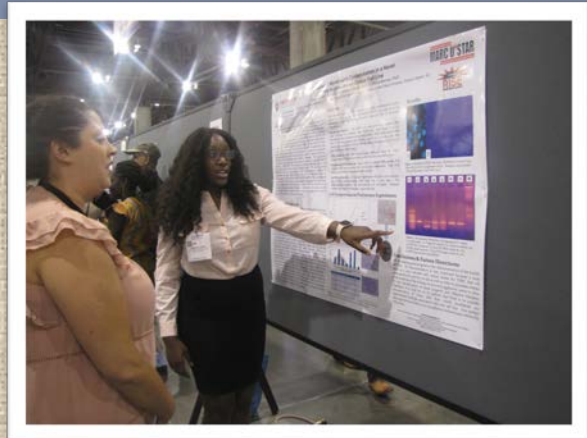
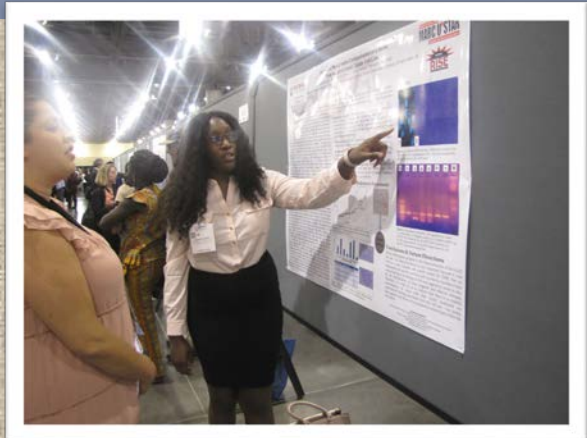
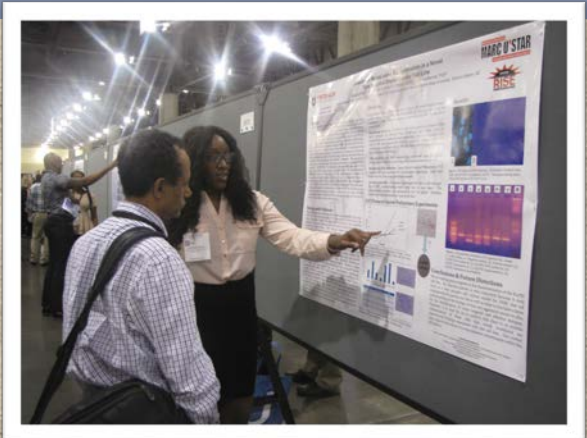
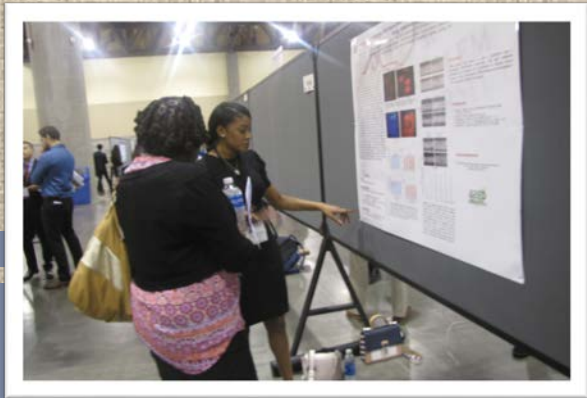
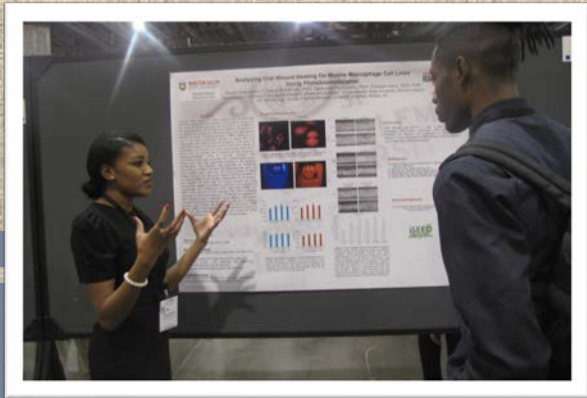












Participating Scholars

STUDENT	MAJOR	PROGRAM	Academic Status
Anne Lenzo	Biology	MARC Scholar	Senior
Tanya Zubov	Biology	MARC Scholar	Junior
Zakiyah Henry	Biology	MARC Scholar	Junior
Abbas Mohamed	Biology	RISE	Junior
Asia Hoke	Biology	RISE	Senior
Brandon Travis	Biology	RISE	Sophmore
Chara Major	Psychology	RISE	Senior
Dynasty Parker	Chemistry	RISE	Junior
Guy Blackmon	Biology	RISE	Senior
Imani Clark	Biology	RISE	Junior
Janai Gaston	Biology	RISE	Senior
Jazmyn Edwards	Sociology	RISE	Senior
Joshua Waller	Exercise Science	RISE	Junior
Kari Dawson	Biology	RISE	Senior
Lakhia Fuller	Biology	RISE	Junior
Shabreya Vample	Biology	RISE	Senior
Sierra Sledge	Exercise Science	RISE	Senior
Tevin Williams	Psychology	RISE	Senior
Thomas Fair	Exercise Physiology	RISE	Senior
Tiffany Dean	Biology	RISE	Junior
Toneia Washington	Chemistry	RISE	Junior
Ziaqueria Short	Biology	RISE	Junior

