



Seewiesen Colloquia

Speaker invited by: Goerlitz Research Group

Thursday, May 11, 2017, 13h, in House 4, Lecture Room

“BATS AREN'T BIRDS OR BUGS: SENSING, STRETCHING, SPINNING, AND THE UNIQUENESS OF BAT FLIGHT”

Sharon Swartz
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Bat wings evolved from grasping, manipulating mammalian hands, and this origin influences the biomechanics of flight in bats in comparison to flight in birds and insects. Therefore, an evolutionary perspective is critical to advancing the comparative biology of flight, and helps distinguish those aspects of flight that are shared in all flying animals and those features that are unique to bats. Low weight, particularly in the wings, is important for all flying animals, but selection for reduced wing mass in bats must interact with aspects of neural control in the most morphologically complex of animal wings. In addition, the nature of wing skin as a complex functional material and the capacity to modulate wing mechanical properties during flight by an unusual group of muscles found only in bats proves critical to bat flight performance. Improved understanding of the functional architecture of bat wings not only provides insight into steady-state flight behaviors, but also holds promise for solving problems concerning bats' abilities to recover from perturbations, fly effectively even following wing damage or injury, etc. This approach requires sophisticated bioengineering techniques such as particle image velocimetry, multi-camera high speed videography, and dynamic modeling, but also low-tech methods including polarized light photography, histology, and anatomical description.

Who is Sharon Swartz?

- 1988 PhD University Chicago, USA
- 1987 Assistant Professor, Departments of Cell Biology & Anatomy, School of Medicine, and Department of Anthropology, College of Arts and Sciences, Northwestern University, USA
- 1990 Asst. Professor, Department of Ecology and Evolutionary Biology, School of Engineering, Brown University, USA
- 2010 Professor, Department of Ecology and Evolutionary Biology, School of Engineering, Brown University, RI, USA
- 2015-16 Interim Director, Sheridan Center for Teaching and Learning, Brown University

Selected publications:

- Bergou, A. J., S. M. Swartz, H. Vajdani, H., D. K. Riskin, L. Reimnitz*, G. Taubin, and K. S. Breuer. 2015. Falling with style: Bats perform complex aerial rotations by adjusting wing inertia. *PLOS Biology*. 13(11): e1002297.
- Konow, N., J. A. Cheney, T. J. Roberts, R. J. von Busse, and S. M. Swartz. 2015. Spring or string: Is bat wing muscle mechanics during flight influenced by tendon elastic action? *Proceedings of the Royal Society of London - B*. 282(1816): 20151832.
- Cheney, J. A., N. Konow, K. M. Middleton, K. S. Breuer, T. J. Roberts, E. L. Giblin, and S. M. Swartz. 2014. Membrane muscle function in the compliant wings of bats. *Bioinspiration and Biomimetics* 9:025008.
- Harper, C. J., S. M. Swartz and E. L. Brainerd. 2013. Specialized bat tongue is a hemodynamic nectar mop. *Proceedings of the National Academy of Sciences*. 110:8852-8857.
- Swartz, S. M. D. J. Willis, and K. S. Breuer. 2008. Aeromechanics in aeroecology: Flight biology in the aerosphere. *Integrative and Comparative Biology* 48: 85-98. doi: 10.1093/icb/icn054