

SEMINAR

School of Biological and Health Systems Engineering

Investigating insect wing hydraulics through biomechanics

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9:00 a.m. - 9:50 a.m., SCOB 210

Faculty Host: Sarah Stabenfeldt



Abstract Insect wings are often thought of as dead, lifeless cuticle, but a functioning and healthy wing is inextricably linked to the active circulatory flow within. Dr. Salcedo's focuses on the living network within an insect wing, a tiny microfluidic structure, filled with hemolymph (insect blood), an air network, and a branching nervous system. Her research examines the intersection between wing morphology, hemodynamics, and wing function. Hemolymph, an insect's blood, serves to hydrate tissues, supply nutrients to the nervous and respiratory systems, and circulate cells involved in immune function. Flow of hemolymph is also involved in insect development, serving as a hydraulic tool during growth, metamorphosis, and wing expansion. Within the wing, hemolymph circulation is necessary for living organs and sensory structures that exist within the wing itself. However, while the structural and aerodynamic properties of insect wings are relatively well-studied, the internal, living systems within wings—and the flow that supplies them—have been largely ignored, despite their critical importance for insect ecology and evolution. This talk will explore critical hypotheses and consequences of circulation within wing veins and pressing bioinspired engineering issues concerning insect health in climate change and applied agriculture.

Biosketch In 2012, Dr. Mary Salcedo dual-majored in Applied Computation Mathematics and Molecular Biology at the University of Washington (Seattle) and worked in Dr. Tom Daniel's neuromuscular-flight lab. Before graduate school, Dr. Salcedo worked as a research technician in Dr. Stacey Combes' lab at the Concord Field Station studying kinematics and predatory flight behavior of dragonflies catching prey. In 2019, she earned their Ph.D. in Organismic and Evolutionary Biology at Harvard University, focusing on fluid dynamics of hemolymph in insect wings supported by a National Science Foundation (NSF) Graduate Research Fellowship. From July 2019-June 2022, she worked as an NSF Postdoctoral Researcher with Dr. Jake Socha (Biomedical Engineering and Mechanics Dept) at Virginia Tech measuring and quantifying circulation and breathing in insects. Before accepting a position at Arizona State University as a Project Manager in the School of Biological and Health Systems Engineering at ASU, Dr. Salcedo worked (July 2022 - March 2024) as a USDA National Institute of Food and Agriculture Postdoctoral Fellow Cornell with Dr. Sunny Jung in Biological and Environmental Engineering, and Dr. Anurag Agrawal in Entomology and EEB. Her research focused on toxicology in insects, specifically within their wings.

Dr. Salcedo is committed to diversity and equity in all of her science and service teams. She currently serves on the national SACNAS Membership Committee, the Society for the Advancement of Chicanos/Hispanics and Native Americans in STEM, a national organization that promotes culture, community, and science. She has served on the Entomology Society of America's Hispanic Committee. Dr. Salcedo created project management workshops (June and Oct 2022) for academics (through the professional Society of Integrative and Comparative Biology) and online content, which teach modern project management strategies to SICB members with trained Lean-Agile industry-certified coaches. In 2021 in acknowledgement of her efforts with SICB for the last decade, she received the inaugural SICB award for Diversity, Equity, Inclusion and Justice.

Dr. Salcedo currently works as a project manager in the School of Biological and Health Systems Engineering at Arizona State University. She manages an award from the Flinn Foundation to facilitate new partnerships with local healthcare industries.