Boulder Fluid and Thermal Sciences Seminar Series

Tuesday, October 25, 2016
3:30pm-4:30pm (refreshments at 3:15pm)
Bechtel Collaboratory in the Discovery Learning Center (DLC)
University of Colorado, Boulder

The upside-down water collection system of a desert moss

Tadd Truscott, *Utah State University*

Desert plants possess highly evolved water conservation and transport systems, from the root structures that maximize absorption of scarce ground water, to the minimization of leaf surface area that enhance water retention. Recent attention has focused on leaf structures that are adapted to collect water and promote nucleation from humid air. Syntrichia caninervis Mitt. (Pottiaceae) is one of the most abundant desert mosses in the world and thrives in an extreme environment with multiple but limited water resources (e.g., dew, fog, snow & rain), yet the mechanisms for water collection and transport have never been completely revealed. S. caninervis has a unique adaptation where it uses a tiny hair (awn) on the end of each leaf to collect water, in addition to that collected by leaves. Herein we show that the unique multi-scale structures of the hair are equipped to collect and transport water in four modes: nucleation of water droplets and films on the leaf hair from humid atmospheres, collection of fog droplets on leaf hairs, collection of splash water from raindrops, and transportation of the acquired water to the leaf itself. Fluid nucleation is accomplished in nano structures, while fog droplets are gathered in areas where a high density of small barbs are present and then quickly transported to the leaf at the base of the hair. Our observations reveal nature's optimization of water collection by coupling relevant multi-scale physical plant structures with multi-scale sources of water.

Biography: Tadd Truscott's current research interests are in fluid dynamics, novel imaging and experimental methods. By merging different areas of research, he works on problems such as three-dimensional flow field dynamics of rising spheres and cavitation. Tadd received his B.S in mechanical engineering from the University of Utah, and then attended Massachusetts Institute of Technology for Ph.D. in Ocean and Mechanical Engineering. He is an assistant professor at Utah State University.