

Henry L. Pierce Laboratory Seminar Series

The Pulse of Plants

Abraham Stroock

Professor, Biomolecular Engineering at Cornell University

Abstract:

Plants give life to our planet by pulling critical reagents out of the soil from below (water and micronutrients) and out of the atmosphere from above (light and carbon dioxide). To achieve this feat, they master a wide range of fluid mechanical contexts, from flows in unsaturated porous media around their roots, through nanoconfined flows in their tissues, to turbulent air flows around their leaves. They regulate these steps in the transpiration process passively through their internal and external structure and actively through valves (stomates) that control the coupling to the atmosphere. Through each day, the flux and stress within a plant pulse due to physical and biological responses to fluctuations in sunlight, wind, temperature, and humidity in the microenvironment. This pulse of plants defines their productivity and efficiency in both natural and agricultural contexts. In this talk, I will describe our work measuring these dynamics with a microfluidic sensor that itself borrows design principles from the vascular structure of plants. I will use our efforts to model the observed dynamics to illustrate the coupling of the various flows mentioned above with the physiology of plants. I will also point toward implications for improved understanding of the biology and increased efficiency in the management of water in agriculture.

Bio:

Abe Stroock is the Gordon L. Dibble '50 Professor and William C. Hooey Director of the Smith School of Chemical and Biomolecular Engineering at Cornell University. He is also an associate director of the Cornell Initiative for Digital Agriculture. His research relates to engineering microchemical processes with an emphasis on transport phenomena, thermodynamics, and physiology. Current topics in his lab involve the development of tools with which to manipulate metastable states of liquid water for the pursuit of fundamental questions in physical chemistry, plant physiology, and environmental transport and with applications in heat transfer and environmental sensing. He obtained his BA in Physics from Cornell in 1995 and his PhD in Chemical Physics in 2002 from Harvard University. He received an MIT Technology Review TR35 Award and an NSF CAREER Award.



Wednesday, October 2nd, 2019

4 pm

Room 1-131

Faculty Host:

Prof. Benedetto Marelli

For additional information please visit:

[https://www.cheme.cornell.edu/faculty-directory/
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