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Due to COVID-19, Spring 2021 colloquia will be virtual.

November 13, 2020 at 1:00pm - Dr. Rose Abramoff, LSCE (Laboratoire des Sciences du Climat et de l'Environnement) in France. Dr. Abramoff is also an affiliated scientist at Lawrence Berkeley National Lab.
"Microbes, minerals, and math: Mechanisms of soil C sequestration, the models used to make predictions, and their role in understanding global climate change"
Soils store more than 2500 Pg of carbon (C), more than in plants and the atmosphere combined. As such, they are the largest potential land sink (or source) of C emissions over the coming decades. Microorganisms and fauna that live in the soil may respire more CO2 into the atmosphere in response to warming temperatures, but they also decompose organic matter into molecules that may be more easily stabilized by mineral surfaces. As such, biotic and particularly soil microbial activity has great potential to both store and release belowground C. Here, we will explore some of the main mechanisms by which C can be sequestered in soils, using experiments, large datasets and model simulations. We will focus on the contribution of plant inputs to soil C, the accessibility of organic matter to decomposing microbes, and the
protection of organic matter by aggregation and sorption to mineral surfaces. I will show how models are used to predict soil C responses to climate and land use change, and how increasing process-level detail in these models has improved our predictions, but has also revealed new challenges.

January 29, 2021 at 1:00pm: SPECIAL Winter Study Seminar on CRISPR with Dr. Jon Penterman, a Senior Scientist at CRISPR Therapeutics will present his research on "Genomic analysis in CRISPR gene editing therapies." After his talk, there will be time to ask Dr. Penterman more about his research, career path, and decision to pursue a career in industry. Zoom link: https://williams.zoom.us/j/9929222127

CRISPR-based editing has gone from a basic research discovery to a therapeutic drug in less than a decade. Presently, clinical trials are being carried out to evaluate CRISPR-based therapeutics in treatment of sickle cell disease, Beta-thalassemia, Leber congenital amaurosis 10, and certain forms of cancer. There are many more CRISPR-based therapeutics on the horizon. The field of genomics is powering the development of CRISPR-based therapies. In this seminar, I'll discuss

how genomic analyses are used in the development of CRISPR Cas9-based therapeutics. In particular, focus will be given to the strategies used to measure guide-mediated Cas9 editing at the intended genomic target, and how we discover and measure guide-mediated Cas9 editing at unintentional or off-target sites.

March 5, 2021 at 1:30pm: Biology Class of 1960 Scholar presents Dr. Petra Levin '89, Washington University in St. Louis
"Starvation induces shrinkage of the bacterial cytoplasm"

Zoom link: https://williams.zoom.us/j/9929222127

Single-celled organisms are at the mercy of their environment. While the impact of nutrient limitation on gene expression and protein synthesis are well known, their impacts on cytoplasmic dynamics and cell morphology have been largely overlooked. I will present evidence indicating that depletion of utilizable nutrients results in shrinkage of E. coli's inner membrane away from its cell wall and outer membrane. Shrinkage was accompanied by a reduction in cytoplasmic volume and a concurrent increase in periplasmic volume. Plasma membrane retraction occurred almost exclusively at the new cell pole. Shrinkage was independent of new transcription, translation, or canonical starvation-sensing pathways. Cytoplasmic dry mass density increased during shrinkage, suggesting that it is driven primarily by loss of water. Shrinkage was reversible: upon a shift to nutrient-rich medium, expansion started almost immediately at a rate dependent on carbon-source quality. Robust recovery from starvation required the Tol-Pal system, highlighting the importance of envelope coupling during recovery.

April 9, 2021 at 1:30pm: Dr. Sue Rhee, Carnegie Institute
"Understanding Mechanisms of Thermoadaptation in a Desert Extremophile Tidestromia Oblongifolia"

Zoom link: https://williams.zoom.us/j/9929222127

Global warming is changing the habitability of many places on Earth. Plants occupy the largest portion of the land surface and understanding thermo-adaptation in plants is relevant for global sustainability, food security and species conservation. In the 1970s, Carnegie scientists studying *Tidestromia oblongifolia* in Death Valley discovered that this Amaranth is adapted to high temperatures and has optimal photosynthetic rate at 47ºC that is comparable to crop plants in their most favorable conditions. For the past fifty years, the molecular basis of this remarkable thermo-adaptation of photosynthesis has remained a mystery. Using an interdisciplinary approach to combine genomics, molecular biology, ecophysiology, and modeling, we are studying the mechanisms underlying this thermo-adaptation. In the talk, I will present how we restarted the project and overcame some profound challenges, as well as share some initial intriguing transcriptomic and physiological data we are currently obtaining. We anticipate that this study will provide new insight into the upper temperature limit of photosynthesis. Understanding this limit is particularly critical in the context of climate change where the photosynthesis is pushed toward the inhibitory part of the temperature response. Outcomes of this project may lead to the development of industrial biocatalysts, improvement of thermo-adaptation in crops, and new ways of approaching conservation of plants in the context of climate change.

April 23, 2021 at 1:30pm: BIMO Class of 1960 Scholar presents Dr. Gautam Dantas, Washington University School of Medicine
"Predicting and Combating Biotic and Abiotic Disruptions to Diverse Microbiomes"
Prof. Dantas uses approaches from microbial genomics, ecology, synthetic biology, and systems biology, to understand, harness, and engineer the biochemical processing potential of microbial communities.

April 30, 2021 at 1:30pm: Dr. Britt Glaunsinger, UC Berkeley
"How the pandemic coronavirus restricts cellular gene expression"
The coronavirus pandemic has upended society and dramatically changed the face of scientific research. This unprecedented global shift towards the singular goal of understanding how this novel coronavirus works and how to stop it has contributed to a remarkably rapid and deep understanding of the viral lifecycle and virus-host interactions. In this context, I will describe our research on how SARS-CoV-2 restricts cellular gene expression, which helps the virus evade detection by the innate immune system.

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