PHYSICS COLLOQUIUM:
The Role of Chance in the Survival of the Fittest

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Date:
11/13/2020

Time:
10:30 AM-11:50 AM

Link:
Please email snsgradstaff@ucmerced.edu for Zoom link and passcode.

About The Speaker:

Oskar Hallatschek is Associate Professor in the Departments of Physics and Integrative Biology of the University of California, Berkeley. Prior to beginning his faculty appointment at Berkeley in 2013, Oskar spent four years as independent group leader at the Max Planck Society. After completing his PhD in 2005 with Erwin Frey at the Free University in Berlin, he performed postdoctoral research with David R. Nelson and Sharad Ramanathan at Harvard University. Oskar's research has been funded by the National Science Foundation and National Institutes of Health. He was named Simons Investigator for Mathematical modeling in living systems and has recently been awarded Miller and Humboldt Professorships. Oskar's team employs a combination of theoretical models and experiments to investigate the coupling of evolutionary dynamics, ecology and biophysics with the goal to understand and control emergent phenomena in evolving populations. In recent years, he has developed an effective theory of epidemic spread that can account for the effects of spatial processes, including long-range dispersal and gene surfing.

Abstract:

The spreading of evolutionary novelties across populations is the central element of biological adaptation. Models of evolutionary spread have ignored, until quite recently, the randomness inherent in the reproduction process. But having excellent genes is not sufficient to be successful in evolution - one also needs luck to avoid accidents or to be at the right place at the right time. Using microbial evolution experiments and simulations, I elucidate the role of chance in evolutionary processes and show that deterministic models indeed fail to predict the dynamics of evolution as it is observed in microbial evolution experiments. I present novel approaches, combining modeling and experiments, that explain the observed patterns of genetic diversity, spatial spread and adaptation at a cellular scale, where self-driven jamming can impede the expansion, and at a global scale, where the dynamics is sped up by long-range dispersal.