LadHyX Seminar – November 6th, 10:45

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When physics at air-water interfaces intertwine with bacterial behavior

Bacteria in the environment encounter diverse air-water interfaces, be they around bubbles in waste water treatment plants, on top of the thin liquid film covering our lungs, or at the surface of the vast expanse of the oceans. These interfaces are where key transfers of gases or nutrients between the two phases happen, shaping the microscale physico-chemical environment perceived by bacteria. Here I will present two examples of how air-water interfaces can shape bacterial dynamics in the environment. First, I will present how bacteria present in the sea surface microlayer — the thin layer of water separating the atmosphere from marine waters below —can successfully exploit the transient nutrient patches produced by surface-deposited aerosols. Experimental results are explained by a combination of active chemotactic behavior and passive 'wall entrapment' at the air-water interface – a physical mechanism by which motile bacteria reside near boundaries for longer times. Second, I will present our first steps investigating how soil bacteria respond to the presence of evaporative air-water interfaces in soil, and how bacterial dynamics could feed back onto soil drying dynamics. In particular, I will show how biosurfactants, commonly produced by soil bacteria, could impact the sudden emptying of pores in the soil, also known as Haines jumps. Both studies highlight not only how interfaces in the environment modifies the behavior of microorganisms, but also how these behavioral modifications could then in return impact larger scale transport processes.