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Università di Roma Tor Vergata
Dipartimento di Fisica

Seminar

Friday 19th October, h. 14.00

Room Grassano

Prof. David R. Nelson

Lyman Laboratory, Harvard University

"On Growth and Form of Microorganisms on Liquid Substrates"

Abstract

The interplay between fluid flows and living organisms plays a major role in the competition and organization of microbial populations in liquid environments. Hydrodynamic transport leads to the dispersion, segregation or clustering of biological organisms in a wide variety of settings. To explore such questions, we have created microbial range expansions in a laboratory setting by inoculating two identical strains of S. cerevisiae (Baker's yeast) with different fluorescent labels on a nutrient-rich fluid 10^4 to10^5 times more viscous than water. The yeast metabolism generates intense flow in the underlying fluid substrate several times larger than the unperturbed colony expansion speed. These flows dramatically impact colony morphology and genetic demixing, triggering in some circumstances a fingering instability that allows these organism to spread across an entire Petri dish in roughly 24 hours. We argue that yeast colonies create fluid flow by consuming nutrients from the surrounding fluid, decreasing the fluid's density, and ultimately triggering a baroclinic instability when the fluid's pressure and density contours are no longer parallel. Our results suggest that microbial range expansions on viscous fluids will provide rich opportunities to study the interplay between advection and spatial population genetics.

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(P.I. Prof. Luca Biferale)