Abstract Submitted
for the MAR17 Meeting of
The American Physical Society

Non-genetic phenotypic variability and its effect on population performance.[1] THIERRY EMONET, ADAM J WAITE, NICHOLAS W FRANKEL, YANN S DUFOUR, JUNJIAJIA LONG, JESSICA F JOHNSTON, Yale University — Substantial non-genetic diversity in complex behaviors, such as chemotaxis in E. coli, has been observed for decades, but the relevance of this diversity for the population is not well understood. What are the trade-offs that bacteria face in performing chemotaxis in different environments? Can population diversity be tailored to resolve these trade-offs? We examined the functional role of non-genetic diversity in cellular migration by measuring the phenotype and chemotactic performance of tens of thousands of individual, freely-swimming *Escherichia coli* as they climbed a gradient of attractant. We discovered that spatial structure spontaneously emerged from initially well-mixed wild type populations due to non-genetic diversity. By manipulating the expression of a key chemotaxis protein, we established a causal relationship between protein expression, non-genetic diversity, and performance that was theoretically predicted. This approach generated a complete phenotype-to-performance map, in which we found a nonlinear regime. We used this map to demonstrate how the shape of a phenotypic distribution can have as large of an effect on performance as changing the mean phenotype, suggesting that evolution could act on both during the process of adaptation.

[1]We thank Yale HPC, NIGMS 1R01GM106189, and the Allen Distinguished Investigator Program through The Paul G. Allen Frontiers Group for support

Thierry Emonet
Yale University

Date submitted: 11 Nov 2016 Electronic form version 1.4