
Intermittent behavior across scales in biology

Fernando Peruani*¹

¹Laboratoire J. A. Dieudonné (LJAD) – Université Nice Sophia Antipolis – UMR n 7351 CNRS UNS
Université de Nice - Sophia Antipolis 06108 Nice Cedex 02 France, France

Résumé

Intermittent behavior is observed in biological systems at all scales, from bacterial systems to sheep herds. First, I will discuss how *Escherichia coli* explores surfaces by alternating stop and moving phases. Specifically, I will show that a stochastic three behavioral state model is consistent with the empirical data. The model reveals that the stop frequency of bacteria is tuned at the optimal value that maximizes the diffusion coefficient. These results provide a new perspective on how evolution may have reshaped bacterial motility apparatus. Intermittent motion is also observed in sheep, where again a stochastic three behavioral state model provides a quantitative understanding of the empirical data. However, in sheep, individual transition rates depend on the behavioral state of other individuals and collective behaviors emerge. Specifically, I will show that small sheep herds display highly synchronized intermittent collective motion, with the herd behaving as a self-excitable system.

*Intervenant