

Abstract for an Invited Paper
for the MAR09 Meeting of
The American Physical Society

Dynamics of bacterial gene regulation

ATUL NARANG, University of Florida

The phenomenon of diauxic growth is a classical problem of bacterial gene regulation. The most well studied example of this phenomenon is the glucose-lactose diauxie, which occurs because the expression of the lac operon is strongly repressed in the presence of glucose. This repression is often explained by appealing to molecular mechanisms such as cAMP activation and inducer exclusion. I will begin by analyzing data showing that these molecular mechanisms cannot explain the strong lac repression because they exert a relatively weak effect. I will then present a minimal model accounting only for enzyme induction and dilution, which yields strong repression despite the absence of catabolite repression and inducer exclusion. The model also explains the growth patterns observed in batch and continuous cultures of various bacterial strains and substrate mixtures. The talk will conclude with a discussion of the experimental evidence regarding positive feedback, the key component of the minimal model.