

SES05-2005-000028

Abstract for an Invited Paper  
for the SES05 Meeting of  
the American Physical Society

### **Integrated analysis of bacterial quorum-sensing networks**

RAHUL KULKARNI, Department of Physics, Virginia Tech

The regulation of gene expression is fundamental to most processes in cellular biology. At the transcriptional level, regulation occurs by the binding of specific proteins called transcription factors to DNA. Post-transcriptional regulation is often carried out by small RNAs which have become the focus of intense research activity recently. The talk will discuss the physics and biology of these two regulatory mechanisms by focusing on a specific biological system: quorum-sensing networks in bacteria. Quorum sensing is the process by which bacteria communicate to regulate gene expression in response to cell population density. Using an integrated approach which combines computational modeling, bioinformatics and experimental molecular biology, we are studying quorum-sensing pathways in bacteria. This approach led to the discovery of multiple regulatory small RNAs which are an integral part of the quorum-sensing pathway in *Vibrio cholerae* and *Vibrio harveyi*. Modeling of regulation of and by small RNAs in quorum sensing reveals the circuit characteristics controlling the transition from the low cell-density response to the high cell-density response.