ELECTRICAL & COMPUTER ENGINEERING BIO-SEMINAR Fall 2019

When: **Friday 15:00 – 16:00, November 1, 2019**
Where: **ETB 1035**

Speaker: **Pushkar Lele, Ph.D.**

Assistant Professor
Department of Chemical Engineering
Texas A&M University

Title: **Bacterial Motility, Hydrodynamic Interactions, and Molecular Memory**

Abstract: Brownian motion limits the amount of control bacteria have over their movements. To improve the odds of reaching a nutrient source, bacteria have evolved an elegant intracellular signaling pathway – the chemotaxis network – and a motility apparatus – the flagellum. Together, they enable the cell to make temporal comparisons of chemical signal levels and to bias its random walk in response. To successfully migrate in a preferred direction, the bug needs to precisely adapt its response to the current signal levels in the matter of a few seconds. I will present our recent discoveries with the gut-dwelling *E. coli* that demonstrate a novel function for the precision in adaptation. With the aid of *in vivo* single motor biophysical assays, Förster resonance energy transfer, microfluidics, and genetic engineering, we have found that chemotactic memory induces a biphasic response to indole, an important gastrointestinal tract metabolite. When concentrations are high, *E. coli* seems to love indole. When indole levels are low, *E. coli* would rather avoid it. I will speculate on how such metabolite action helps maintain healthy gut microenvironments while resisting pathogens. In contrast, our measurements of hydrodynamic interactions of individual *Helicobacter pylori* cells with no-slip boundaries together with the time reversibility of Stokes flows indicate that adaptation may not be relevant for *H. pylori*-chemotaxis. How do *H. pylori*, which promote stomach cancer, ever find their way when invading our bodies?

Bio: Dr. Pushkar Lele is an assistant professor at the Department of Chemical Engineering, Texas A&M University. He obtained his B.S. in Chemical Engineering from UDCT, Mumbai (India) and a Ph.D. in Chemical Engineering from the University of Delaware. He trained as a postdoc in Professor Howard Berg's biophysics group at Harvard University. His work has been published in journals such as Nature Physics, Science Advances, Current Biology, and PNAS. His research is supported by multiple R01 awards (NIH), the High Risk High Impact Award from the Cancer Prevention Research Institute of Texas, and the DOD-ARL.