



## Colloquium

# Basal Gene Expression Dynamics in Bacteria

**Kirti Jain**

ISTA

Host: Alicia Michael

The multiple antibiotic resistance (*mar*) operon is one of the largest regulons in *Escherichia coli*. The *mar* locus encodes an autorepressor, MarR; an autoactivator, MarA; and MarB, a protein of unknown function and via MarA regulates a wide variety of downstream targets involved in cellular processes such as efflux, pH response, porin regulation, etc. Although this system has been extensively studied for its role in antibiotic resistance, the role of basal expression has largely been overlooked and dismissed as promoter leakiness. Our work explores the basal expression mode of the *mar* operon and shows that it is dynamic, consisting of rare stochastic gene expression pulses. These pulses maximize phenotypic variability in wild-type populations and, unexpectedly, transiently accelerate cellular elongation rates. At the molecular level, this behavior is linked to an unusual yet evolutionarily conserved GTG start codon in *marR*, suggesting that natural selection has preserved this dynamic expression pattern across many related gut bacteria. Together, these findings demonstrate that even so-called “leaky” uninduced gene expression can be a selected feature with meaningful ecological and physiological consequences, reshaping our understanding of gene regulation in microbes. Kirti Jain is a Postdoc Award Recipient of 2025.

**Monday, February 2, 2026 11:00am - 12:30pm**

Raiffeisen Lecture Hall



This invitation is valid as a ticket for the ISTA Shuttle from and to Heiligenstadt Station.

Please find a schedule of the ISTA Shuttle on our webpage:

<https://ista.ac.at/en/campus/how-to-get-here/> The ISTA Shuttle bus is marked ISTA Shuttle (#142) and has the Institute Logo printed on the side.