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*State dependent delays induce novel dynamics in gene regulatory systems*

This talk will review models for the bacterial regulation of gene expression and function for both repressible (negative feedback) and inducible (positive feedback) genes, and the nature of the nonlinearities involved. I argue that both the delays due to transcription of DNA to mRNA and translation of mRNA to produce protein are likely state dependent. The consequences of this turn out to be relatively astonishing in the sense that the state dependence of these delays can lead to completely new dynamical behaviors that are not present when the delays are constant. In both inducible and repressible systems the state dependence in the delays may lead to the appearance of more steady states as well as unexpected bifurcations not present when the delays are constant.

This is joint work with T. Gedon, A. Humphries, H.-O Walther, and Z. Wang.