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Serge Pelet lab Project description

Cells are constantly challenged by extracellular information (growth factors, nutrients, stresses) and need to respond appropriately to these signals in order to proliferate. Signal transduction cascades relay these extracellular stimuli into specific cellular outcomes. We use budding yeast as a model system to understand how extracellular information is relayed into an appropriate cellular response. In this project, we will focus on the response occurring upon hyper-osmotic stress which leads to the activation of the Hog1 MAP kinase. This kinase phosphorylates a wide range of substrates in the cytoplasm to drive the cellular adaptation to this new environment. In parallel, Hog1 accumulates in the nucleus to induce the expression of stress response genes. These genes are controlled by four different transcription factors and their binding sites are present in a wide diversity of configurations on endogenous promoters. In order to understand the mechanism of regulation of each one of these transcription factors, we want to build synthetic promoters harboring individual binding sites for only one type of transcription factor. We will engineer various synthetic promoters containing specific binding sites for one of the four transcription factors downstream of the MAPK Hog1. Once these promoters have been validated, we plan to measure the dynamics of gene expression that they induce using a live cell mRNA reporter system.