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Summer Undergraduate Research (SUR) Programme 2024

Project description:

In multicellular organisms, genes are turned ON and OFF in robust spatial and temporal patterns. Regulatory elements that activate or silence gene transcription are inherently promiscuous and can act over long genomic distances. A basic question is how regulatory elements find their target promoters and restrict their activity to their targets.

On the one hand, we study how regulatory crosstalk is prevented. Insulators were discovered in Drosophila and subsequently in various organisms from yeast to humans, as DNA elements that block communication between a regulatory element and a gene promoter when placed in between. In flies and humans, insulators exert their activity by recruiting insulator proteins. We study the biological relevance and molecular mechanisms of insulator proteins.

On the other hand, we study how genes find their appropriate regulatory elements across surprisingly long genomic distances and skip over non-target genes. We address the biological relevance of these interactions by disrupting them, and we study how they form.

Our studies in flies reveal new evolutionary perspectives into the relevance of 3D genome folding for correctly wiring genes to their regulatory elements.