MBG FOCUS TALK

hosted by Erik Østergaard Jensen

Monday November 20, 2017 at 9:15 - 10:00
Dept. of Mathematics Aud G (1532-116)

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Hacking gene expression: active heterochromatin in genetic arms races

Regulation of gene expression forms the foundation for basic cellular processes, development and disease in multicellular organisms. One major gene regulatory mystery is the active expression of heterochromatin to generate small RNA precursors required for germline genome defense against transposon mobilization. We have discovered that heterochromatic expression of Piwi-interacting small RNAs (piRNAs) in the Drosophila germline works through a 'molecular hub' that recruits paralogs of core gene expression factors. The paralog proteins allow the heterochromatic loci to hijack the canonical expression machinery thereby allowing expression of heterochromatic piRNA loci. Such 'hacking' of gene expression is exemplified by the TFIIA basal transcription faction paralog Moonshiner that drives heterochromatic transcription initiation (Andersen et al., Nature 2017) and a novel nuclear RNA export pathway that we believe enables piRNA precursors to bypass nuclear RNA quality control (unpublished results). The genes involved in this heterochromatic expression make up a rapidly evolving part of the host genome defense system in the arms race against genetic parasites such as transposons. We propose that these genetic host-parasite battles drive mechanistic innovation of gene expression through neo-functionalization of paralogs of core gene expression factors.