# Stony Brook University
# The Graduate School

Doctoral Defense Announcement

## Abstract

A molecular investigation into different paradigms of gene expression

By

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DDM1 (Decrease in DNA Methylation 1) is a Snf2-like chromatin remodeler that serves as a master regulator in the epigenetic silencing of heterochromatin in *Arabidopsis*. In *ddm1* mutants, DNA methylation and H3K9me silencing marks are downregulated, leading to a derepression of transposable element transcription. DDM1 co-localizes with H3.1 and H3.3 during the cell cycle and we found DDM1 also promotes histone variant exchange, as *ddm1* mutants show a loss of histone variant H3.1 (associated with heterochromatin) deposition, resulting in increased and ectopic histone H3.3 (associated with active transcription) deposition.

The single-particle cryo-EM structure of DDM1 was determined with a variant nucleosome at 3.2 Å resolution, revealing engagement with histone H3.3 and an unmodified H4 tail. Both the DEXD ATPase and HELICc domains of DDM1 engage with the nucleosome at the SHL2 position, making contacts with both DNA gyres of the nucleosome, while also making specific contacts with histones H3.3 and H4. This structural information reveals key features of DDM1 that are essential for enzymatic activity (such as a disulfide bond within the HELICc domain) and specific nucleosome substrate recognition, both necessary for its role in maintaining heterochromatin.

**Date**: June 4, 2024 **Program**: Genetics
**Time**: 2:00 pm **Dissertation Advisor**: Leemor Joshua-Tor
**Place**: Cold Spring Harbor Laboratory, Hawkins Building, Wendt Conference Room
*To attend virtually, contact the Program Director at* martha.furie@stonybrook.edu.