

DEPARTMENT OF CHEMISTRY
COLLEGE OF ARTS AND SCIENCES

SUMMER RESEARCH OPPORTUNITIES FOR UNDERGRADUATE WOMEN

APPLICATION DEADLINE: 03/01/2018

PROJECT TITLE: Characterization of protein-protein interactions leading to mechanical changes upon the start of cellular division

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Project Description

Research in the Dima group focuses on understanding the role of various structural and cellular factors in the mechanical response of biological molecules ranging from small multi-domain proteins to large fibrillar assemblies that play crucial roles in fundamental processes such as the maintenance of the cell shape, cell mobility, cell-cell adhesion, wound closure, axonal growth, and cellular division (mitosis). A project for a WISE student is “Characterization of protein-protein interactions leading to mechanical changes upon the start of cellular division”. Microtubules, the main component of the cell cytoskeleton, play fundamental roles in cellular processes ranging from cellular transport to mitosis. These roles are all intimately connected with microtubules' ability to depolymerize under controlled cellular conditions. This control is exerted by a large array of molecular machines (300 or so species). Recent experimental results strongly suggest that this large array of protein cofactors work by applying mechanical forces to the microtubule lattice, but little is known about the details of the process. The goal of this project is to determine the main types of interactions between molecular machines and microtubule filaments responsible for changes in the mechanics of these filaments upon the start of mitosis. The student will gain experience with bioinformatics methods and protein databases, learn to use simulation software to follow protein structure deformation under applied forces, and gain knowledge of current scientific literature on the subject.