

## Bankhead-Coley Cancer Research Program

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*Biological Science  
Florida State University*

*2008 Program  
New Investigator (3-year project)*

**Project Title:** Chromosome Mechanics in DNA Double-Strand Break Repair

**Project Summary:** The long-term goal of this grant is to elucidate the molecular mechanisms responsible for regulating the dynamic progression of changes in higher-order chromosome structure that are necessary to safeguard genomic integrity. A landmark of biomedical research is the completion of sequencing the human genome, but we do not yet understand how DNA is packaged into a higher-order chromosome structure inside the living cell. Chromosome organization is achieved by the action of a class of conserved and essential protein factors, including the protein complexes condensin and cohesin. Our preliminary studies of condensin and cohesin function have led us to the identification of a practical approach to characterizing chromosome higher-order structure formation and its function in DNA break repair at the point of their occurrence in a living cell. One hallmark of cancer cells is genomic instability arising from errors during the repair of chromosome lesions. Our approaches have broad applications for investigation of the *in vivo* cellular and biochemical activities of factors required for chromosome structural dynamics and functions. This research will provide insights into the genetic and molecular mechanisms of chromosome lesion repair in a model eukaryote and will have implications for our understanding of some of the factors contributing to genomic instability and tumor formation.