THE GRADUATE COLLEGE OF THE
UNIVERSITY OF OKLAHOMA HEALTH SCIENCES CENTER

ANNOUNCES THE FINAL EXAMINATION OF

Emily Louise Kurdzo

FOR THE DEFENSE OF THE DOCTOR OF PHILSOPHY DEGREE
GRADUATE COLLEGE
DEPARTMENT OF CELL BIOLOGY

Friday, October 28, 2016 10 a.m.
Biomedical Research Center, Room 109

The role of centromere-centromere interactions in meiosis of *Saccharomyces cerevisiae*

COMMITTEE IN CHARGE: Dean S. Dawson, Ph.D., Chair, Gary J. Gorbsky, Ph.D., Christopher Sansam, Ph.D., Eric W. Howard, Ph.D., Linda M. Thompson, Ph.D.

ABSTRACT: The segregation of chromosomes during meiosis is complicated by a unique obstacle not shared with mitosis – homologous chromosomes must find one another and form a stable association that persists until anaphase I. Throughout meiotic prophase in budding yeast, *Saccharomyces cerevisiae*, chromosomes interact in a number of ways at the centromere. First, in early prophase, centromeres interact with non-homologous partner centromeres through a phenomenon called centromere coupling. The second type of centromere-centromere interaction typically occurs between homologous chromosome centromeres. This unique and conserved phenomenon, termed centromere pairing, has been found to be important for segregation of chromosomes, especially those that fail to form a crossover (termed achiasmate chromosomes). Both of these centromere-centromere tetherings are mediated by a functionally-conserved structural protein, Zip1. The focus of this work is the examination of the role Zip1 plays in these centromere associations in prophase, and by what mechanism Zip1 is moderated to assume its many different roles, in synchrony with the rest of meiotic progression. To tackle these questions, we implemented the use of many different variations of the *ZIP1* gene – including a phosphomimetic mutant incapable of centromere coupling, a series of nine in-frame deletion mutants, and a series of short truncated portions of Zip1 fused to a fluorescent protein. From this work, we have been able to find sufficient evidence to conclude centromere coupling and pairing are distinct mechanisms, controlled by separate processes, both mediated by Zip1. Portions of the N- and C-termini of Zip1 have been identified as critical for centromere coupling, while a different portion of the N-terminus of Zip1 has been identified to be critical for centromere pairing and achiasmate chromosome segregation. In addition, we have begun to shed light on the aspects of the mechanism, distinct from centromere pairing itself, which promotes achiasmate segregation. Zip4 and Shugoshin 1 are two proteins implicated in this mechanism. Possible models for how centromere pairing leads to proper chromosomes segregation are discussed.