

Chapter 18
Web Text Box 1

Poles apart: centrosome duplication through the cell cycle

The major events of the cell cycle concern the replication (S phase) and segregation (M phase) of the genome. How are these nuclear events integrated with the reorganization of the cytoskeleton through the cell cycle, particularly at M phase when cytoplasmic microtubules are broken down and a completely new structure, the mitotic spindle, is assembled? Microtubules arise from the centrosome, a complex structure that is assembled around a pair of centrioles (book page 283). Centrosomes are mysterious and fascinating cellular structures that replicate in a conservative manner. During S phase, the two centrioles separate and each forms a new procentriole at its proximal end. Although the mechanism of this first step in centriole replication remains unknown, we know that it requires phosphorylation of a protein called nucleophosmin by either CDK2-cyclin E or CDK2-cyclin A. During G2 the procentrioles elongate. The mature centriole pairs then separate during the initial stages of mitosis to form the spindle poles. This final step requires the phosphorylation of a kinesin isoform called Eg5 by CDK1-cyclin B.