

Biology 486: Chromosomes and the Cell Cycle

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Life depends on the propagation of genetic material from one generation to next through cycles of genome replication and cell division. We will focus on chromosomes as discrete entities, rather than collections of genes, that are partitioned between daughter cells with high fidelity to ensure that the genome remains stable over many generations. By reading selected primary literature covering several decades, we will build an understanding based on key experiments and insights, focusing on chromosomes and their associated molecular machinery. Topics may include kinetochores and microtubule dynamics, centromeres, asymmetric inheritance in stem cells, cohesion, the mitotic checkpoint, aneuploidy and cancer, genetic conflict, chromosome evolution, and artificial chromosomes.

Prerequisites: The course is designed for advanced biology students who have taken BIOL 205 (Cell Biology) or equivalent. It is also open to graduate students.

There is no textbook for the course, though one of the standard cell/molecular biology textbooks (Alberts et al. *Molecular Biology of the Cell*, Lodish et al. *Molecular Cell Biology*, or equivalent) is useful for background knowledge.

Readings from the primary literature will be assigned for each meeting and provided as pdf files. Presentations of these papers and class participation, including questions and critical evaluation, are an essential part of the course. Grading will be based on a final paper in the form of a research proposal (50%) and on class participation (50%).

Students are expected to read the assigned papers before class and come prepared to discuss them in detail. For each paper, students will be asked during class to do the following:

- Provide a brief introduction that puts the paper in context. What is the biological question and why is it an important question? What was known about the topic before this paper?
- Present individual figures. Explain the motivation for the experiment, the experimental strategy and methods, the data, and the interpretation. Are the data convincing?

The final project is a proposal to be written on a topic of your choice that is somehow related to the class. The general idea is to pick a problem or a question and design an experiment (or experiments) to provide some insight and advance our knowledge. For example, one way to approach it is to develop a hypothesis and design your experiment to test the hypothesis, or to propose different plausible models to explain a phenomenon and design an experiment to distinguish between the models.