

Syllabus

The Wonders of Modern Biology

Instructor: Khristian Erich Bauer-Rowe

Course Objectives: This course is intended to provide greater insight into a selection of four exciting and important areas in biology: genetics, immunology, cancer, and stem cells. Lectures will provide an overview of the specific area followed by a detailed discussion of related issues or problems. You will also be reading four scientific papers to see first-hand the cutting-edge research being done to address these problems. The key goal is to become conversant in the language of biology and to greater appreciate this exciting field.

Unit I: Genetics



Lecture 1: RNA world theory and the “Central Dogma.” Critical questions include: How did DNA and RNA arise? How does information flow in the cell? How is this flow regulated or interrupted?

Lecture 2: Epigenetics and DNA/RNA Paradoxes. Critical questions include: How does a cell become a specific type? Why is 98% of our genome composed of “junk DNA?” What is the purpose of RNA interference?

Unit 2: Immunology



Lecture 3: An overview of the immune system. Critical questions include: How does the immune system respond to a pathogen? How do lymphocytes communicate? How does a memory cell “remember” a specific pathogen?

Lecture 4: Immunity and Viruses. Critical questions include: How does the immune system produce antibodies? Why do epidemics and pandemics occur? What causes autoimmune diseases?

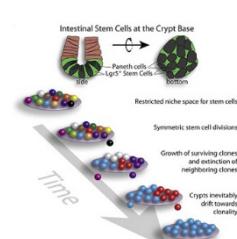
Unit 3: Cancer



Lecture 5: Defining cancer. Critical questions include: What *exactly* is cancer? What are the genetic causes of cancer? How does cancer metastasize?

Lecture 6: Cancer metabolism, treatment, and resistance. Critical questions include: What is the metabolic profile of cancer cells and can it be exploited? How can cancer be treated more effectively? What are the mechanisms of resistance?

Unit 4: Stem Cells



Lecture 7: Defining a stem cell. Critical questions include: What constitutes a stem cell? How does the stem cell niche affect the self-renewal and differentiation? How do stem cells differentiate?

Lecture 8: The functional role of adult stem cells. Critical questions include: What is the role of stem cells in tissue homeostasis? Do cancer stem cells exist? How do stem cells contribute to aging and disease?