

# 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.

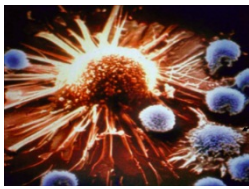
### Unit 1: Genetics



**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?

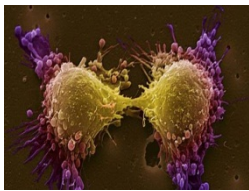
### Unit 2: Immunology



**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?

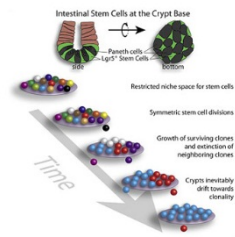
### Unit 3: Cancer



**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?