## **Course Title**: Project Lab in Microbiology

**Course Number**: BIOLUN3058

The impact of microbes on our planet is profound and underappreciated. During the 3.5 billion years for which they have ruled Earth, microbes have evolved all forms of known metabolism, including oxygenic photosynthesis and aerobic respiration. Earth's microbial biomass, which is five times more abundant than that of plants, significantly impacts all geochemical cycles. The human body contains ten times more bacterial cells than human cells, and commensal bacteria are required for a functional digestive tract and immune system. Undoubtedly, a thorough understanding of basic microbiology should be mandatory for any life scientist.

The field of microbiology is undergoing a revolution on many fronts. Understanding antibiotic resistance is an increasingly pressing issue. Academic labs and companies worldwide are metabolically engineering bacteria that may generate alternative fuel sources. Bacteria are being engineered to create or eat plastics and to clean up oil spills efficiently.

You will learn about the importance, diversity, and beauty of the microbial world and you will be exposed to current techniques and applications within microbiology.

Course description

Most bacteria tend to aggregate into multicellular communities. As in multicellular eukaryotes, intercellular signaling plays an important role in establishing these communities. Bacteria producing brightly-colored signaling compounds are present in most soils. Students will isolate bacteria and observe multicellular development and pigment production. The popular model organism Pseudomonas aeruginosa will be used to demonstrate molecular techniques. This bacterium releases yellow, blue and red pigments called phenazines that we now know act as signaling molecules. The students will investigate how these signals may be involved in orchestrating cell aggregation.
The microbiology lab course will:
- introduce students to basic microbiological techniques: preparation of growth media; isolating and inoculating bacteria; monitoring bacterial growth by optical density; genetic screens; digital microscopy to monitor colony development; enrichment techniques for pigments.
- raise students' awareness of the ubiquity of microbes and provide an overview of microbial metabolic and morphological diversity
- introduce students to the following key concepts: biofilm formation; Quorum sensing (signaling); the diverse roles of bacterial pigments as antibiotics, signals and metabolites.

# Course Summary:

| Date | Details | Due |
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| Mon Feb 20, 2023 | Assignment presentations | due by 11:59pm |
| Fri Apr 28, 2023 | Assignment Final Paper | due by 11:59pm |