The Good, the Bad and the Beautiful
Instructor Guide

Introduction:
Course: This activity is designed for Microbiology for Health Science Majors
Time: 1.5 hour lecture, 15-10 min discussion, 1.5 hour lab + 10 min weekly follow-ups, outside assignments
Materials: activity documents
Student preparation: general knowledge of microbiology, chemosynthesis and photosynthesis
Summary: to understand beneficial and harmful roles of microbes in relation to humans, observe the research process and to model a microbe ocean environment.
Purpose:

1. Understand beneficial, harmful and novel roles of microbes.
2. Observe research scientists collecting and analyzing data related to beneficial microbes.
3. Demonstrate chemosynthesis and photosynthesis by modeling a microbe ocean environment.

Resources:
The Good: address the benefits of microbes

- Host-Microbe Interactions: Part 1
- The Good: Student Activity
- Article: Going Deep for Drug Discovery

The Bad: address the harm of microbes

- PPT lecture: "The Bad"
- Host-Microbe Interactions: Part 2

The Beautiful: build a microbe ocean environment

- Winogradsky Column: Student Activity
- Winogradsky Column: Background and Instructions
- Winogradsky Column: Poster

Videos (see handouts):
C-DEBI introduction:

- https://www.youtube.com/watch?v=8sSN1psBeXk (full version)
- https://www.youtube.com/watch?v=wiYzGL4iTY8&feature=youtu.be (science only version)

The Good: Introduction to the deep biosphere

- http://player.vimeo.com/video/78237963?title=0&byline=0&portrait=0 (Dr. Kirkpatrick)
- http://player.vimeo.com/video/78264216 (part 2; Dr. Reese)
- https://player.vimeo.com/video/78264213 (part 1 optional; Dr. Reese)
- http://player.vimeo.com/video/78268179 (part 3 optional; Dr. Reese)

The Beautiful:

- Introduction to the deep biosphere: http://player.vimeo.com/video/78232937 (introduction; Dr. Reese)

- Chemosynthesis and Hydrothermal Vent Life: http://oceanexplorer.noaa.gov/edu/learning/player/lesson05.html
- Introduction to Winogradsky Column: http://www.sumanasinc.com/webcontent/animations/content/winogradsky.html

Activity Outline

1. Introduce and set-up Winogradsky Columns (~1.5 hours in lab)
    a. Give students "Winogradsky Column" Activity. Read Winogradsky background and instructions
    b. Start ~1 month into the course
2. Winogradsky column follow-up (throughout the semester, ~2 months)
    a. Throughout the semester, observe and document data once a week (~15 min each time); part 1
    b. During the semester, students complete part 2: "How do microbes obtain energy"
    c. During the semester, students complete part 3: "What happens in a Winogradsky Column?"
    d. Complete activity at end of the semester. Students do part 4: "Write a lab report"
3. The Good (< 30 min in class)
    a. Assign "The Good" student activity (can be completed outside of class). Complete in last 2-3 weeks of semester as activity is designed to be a comprehensive, analytical assignment to microbes discussed throughout the course
    b. Discuss findings with students in class (30 min or less depending on time)
4. The bad (~1.5 hour in lecture)
    a. Teach on the bad of microbes; place at a convenient point during the semester
    b. Resources include: PPT for "The Bad" lecture, Outline of lecture notes

TOOLKIT CREDITS:
Developed by Rebecca Kapley, (Cuyahoga Community College, OH), with support by the rest of the C-DEBI Collaborative Toolkit Team.

WEBSITE:
http://www.coexploration.org/C-DEBI/toolkits_biology.html