APPM 4390/5390: Modeling in Math Biology
Instructor: David Bortz *

Spring 2021 MW 4:10-5:25

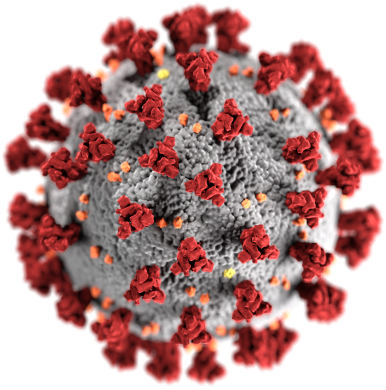
It is a common refrain to hear how the 21st century is *The Century of Biology*. But, what does that mean for mathematicians who want to work on real biological problems and biologists who want to employ sophisticated mathematical tools to help understand a particular phenomena? And, most importantly, what does that mean for students who aspire to bridge the gap?

The goals for this class are for students to:

(1) Develop a fundamental understanding of how mathematical models are created from data in the biological sciences
(2) Illustrate how the study of these models can be used to gain novel insights in complex biological systems. We will thoroughly investigate case studies in several fields including: **Infectious Disease Epidemiology, Molecular Systems Biology, Sea Turtle Ecology, Glucose Metabolism, Neuron Action Potential Propagation, HIV Pathogenesis, and Microbial Community Dynamics.**

This class is designed for advanced undergraduate and beginning graduate students in the mathematical and physical sciences as well as biologists with a solid mathematical background.

The course prerequisites (which can be waived with instructor approval) are Differential Equations (APPM 2360 or equivalent) and Linear Algebra (APPM 3310 or equivalent), and may be taken simultaneously with this course. Also note that familiarity with MATLAB or other programming language is assumed. We will be using two textbooks: *Essential Mathematical Biology*, Nick Britton, Springer, 2003 and *Dynamic Models in Biology*, Stephen Ellner and John Guckenheimer, Princeton University Press, 2006. These books will be supplemented by material from the current literature and lecture notes from the instructor.



SARS-CoV-2 illustration
(from CDC)

*In the last year, Prof. Bortz has served as a member of the State of Colorado's COVID-19 modeling team. Accordingly, where feasible in the course, we will make use of data and examples from the pandemic and it's impact locally and around the world.