

Abstract Submitted
for the MAR16 Meeting of
The American Physical Society

Development of a Hands-On Survey Course in the Physics of Living Systems MEGAN MATTHEWS, DANIEL I. GOLDMAN, Georgia Institute of Technology — Due to the widespread availability and technological capabilities of modern smartphones, many biophysical systems can be investigated using easily accessible, low-cost, and/or “homemade” equipment. Our survey course is structured to provide students with an overview of research in the physics of living systems, emphasizing the interplay between measurement, mechanism, and modeling required to understand principles at the intersection of physics and biology. The course proceeds through seven modules each consisting of one week of lectures and one week of hands-on experiments, called “microlabs”. Using smartphones, Arduinos, and 3D printed materials students create their own laboratory equipment, including a 150X van Leeuwenhoek microscope, a shaking incubator, and an oscilloscope, and then use them to study biological systems ranging in length scales from nanometers to meters. These systems include population dynamics of rotifer/algae cultures, experimental evolution of multicellularity in budding yeast, and the bio- & neuromechanics involved in animal locomotion, among others. In each module, students are introduced to fundamental biological and physical concepts as well as theoretical and computational tools (nonlinear dynamics, molecular dynamics simulation, and statistical mechanics). At the end of the course, students apply these concepts and tools to the creation of their own microlab that integrates hands-on experimentation and modeling in the study of their chosen biophysical system.

Megan Matthews
Georgia Institute of Technology

Date submitted: 05 Nov 2015

Electronic form version 1.4