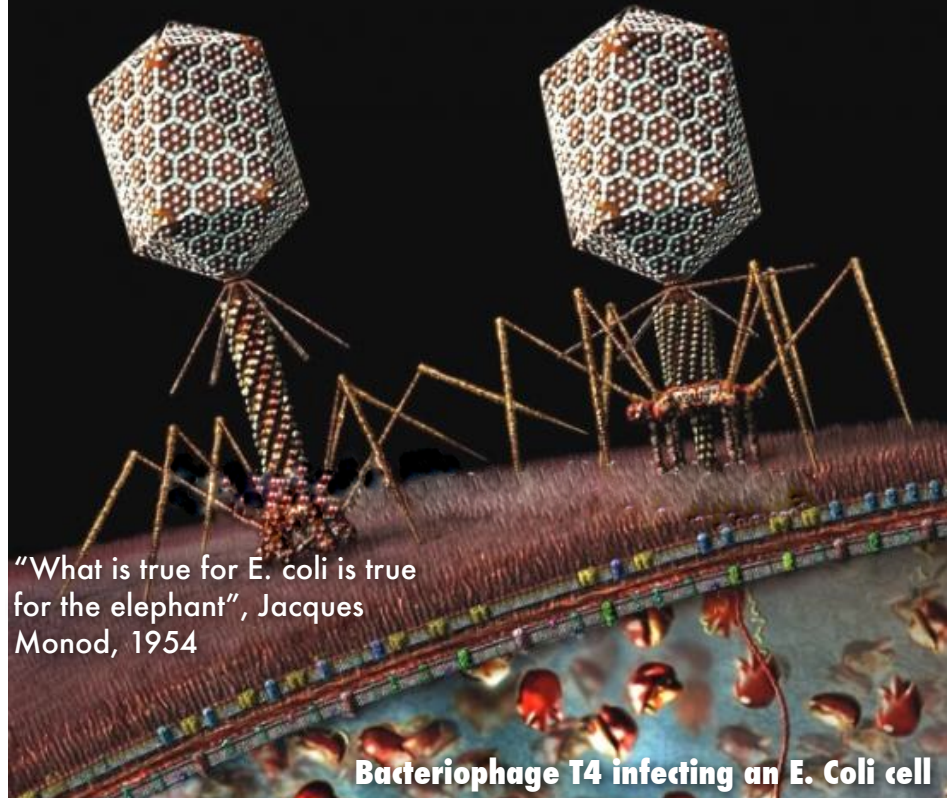


# Microbiology: Biophysics and Molecular Biology

NEW INTERDEPARTMENTAL AND INTERDISCIPLINARY COURSE

INSTRUCTORS:  
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# 2011



"What is true for E. coli is true  
for the elephant", Jacques  
Monod, 1954

**Bacteriophage T4 infecting an E. Coli cell**

Microorganisms are used today in all areas of science and bio-engineering.

*This course aims to integrate fundamentals in microbiology and virology with the latest account of relevant biophysics. For that reason, for the first time, the course is co-taught by both Departments of Physics and Biology.*

The study of micro- and nano-organisms (such as viruses) has been critical in our current understanding of basic biological processes, evolution, and the functions of the biosphere, and has contributed to numerous fields of science and most importantly the field of molecular biology. Microbes have the amazing ability to grow in extreme

conditions, to grow slowly or rapidly, and to readily exchange DNA. They are essential for life as we know it, but can also be agents of disease. They are instrumental in shaping the environment, evolution, and modern biotechnology. They can be compared to natural engineering laboratories for creating new capabilities for industry (e.g., pharmaceuticals, chemicals, energy), and are the foundation of pioneering efforts in synthetic biology and biological physics – i.e. building life from its component parts. Effective study of microorganisms and viruses and their applications demands multiple interdisciplinary approaches that cross all scales of biological organization. With an interdisciplinary focus, we merged microbiology with biophysics. Like all branches of physical science, biophysics encompasses a search for

simplifying generalities. Despite kaleidoscopic diversity displayed by microbes and viruses, unifying physical mechanisms have been identified, which provides tremendous opportunity for discovery.

**Tu & Th 12-1.20 pm,  
start 01/11/11**

Undergraduate Course for Physics,  
Biology and Chemistry Students  
Also open to graduate students  
9 Units  
Wean Hall 542  
No course prerequisites  
E-mail: alexe@cmu.edu

Carnegie Mellon University



Department  
of Biological  
Sciences

The course provides introductory level molecular biology that is aimed for students from all disciplines of natural science. It covers microbiology, genetics, genomics and virology, as well as related biophysics of RNA and DNA packaging, protein self-assembly and molecular motors. We also review the latest biophysical methods with a focus on single molecule techniques that have revolutionized the biological sciences.