

QB 828, *Biology for the Interdisciplinary Scientist*

QB 828, *Biology for the Interdisciplinary Scientist* (3 credits) is designed for non-biologists in the QB program. In QB 828, students learn the language of biology and understand biological concepts in the context of the canonical questions addressed by biologists. General concepts such as regulation, specificity, synthesis/degradation, localization/transport, and cellular interactions are the biological elements that form the basis for model systems and for some of the classic methods used to answer questions about the systems. To lay the groundwork for posing the quantitative questions, students actively explore major cell biological concepts (e.g., space and time scales, organelles, cell cycle, membrane structure, and typical features of viruses, bacteria, fungi, animals, and plants) and biological molecules (nucleic acids, proteins, saccharides, lipids, steroids, and small molecules). Thermodynamics and chemical kinetic theory are reexamined in the context of cell biology. Emphasis is placed on describing the underlying mechanisms and useful experimental and computational methods, with examples taken from detailed studies of model systems. Among the topics covered are protein folding and structure, molecular machines, cell signaling and networks, and metabolic regulation. Topics are introduced using review papers and primary research reports that are accessible to students across disciplines, and that provide examples in which quantitative approaches have helped solve problems. A typical topic treatment, illustrated by protein folding, goes from theory (e.g., transition-state vs. landscape theory), to useful experimental (e.g., optical methods, rapid mixing and laser temperature jump, or mechanical stretching) and computational methods (e.g., molecular dynamics and Langevin simulations), and is illustrated with examples (e.g., α -helix formation, hydrophobic collapse, and tertiary structure formation).