

Biochemistry and Chemical Biology: One major, two tracks

The fields of Biochemistry and Chemical Biology have much in common and rely on a shared set of fundamental concepts, unified by chemical and quantitative principles and knowledge. Common areas of interest between the two tracks include:

- *Molecular structure and function*, studying the relationships between chemical structure and reactivity and function in a biological context.
- *Quantitative biophysical chemistry*, the application of biophysical principals.
- *Molecular probe discovery*, the identification of small molecules to effect discrete changes in protein function and serve as potential leads for disease treatment (e.g. drug discovery).

Biochemistry is the study of the molecules, chemical reactions and pathways that take place in living systems, and is concerned with quantifying the structures, interactions, and activities of biomolecules in pure form. For example, Biochemistry includes

- *Molecular Biology*, understanding the functions and interactions of biomolecules at the molecular level
- *Structural Biology and Biophysics*, exploring the atomic structures, mechanisms, and assembly of biomolecules through chemical and physical principles
- *Enzymology*, how protein and RNA machines catalyze chemical reactions, and how their regulation influences cellular pathways

Chemical biology emphasizes the use and development of chemical insight, new techniques and molecular tools to study and/or manipulate biological systems. For example, Chemical Biology now encompasses:

- *Synthetic chemistry*, the application of chemical synthesis to generate tools for studying biological systems.
- *Synthetic biology*, the engineering of organisms to make small molecules, from biofuels to pharmaceuticals
- *Bioanalytical chemistry*, inventorying the molecular species in biological systems by developing new methods and instrumentation
- *Biomaterials*, the development of new materials (e.g. nanomaterials) for drug delivery and biomedical engineering.