Angela Lamb

Interdisciplinary Major

Molecular Biophysics

I came into Hendrix College knowing that I wanted to major in some discipline of science, but choosing between physics, chemistry, biology, and mathematics has been much more difficult than I would have ever imagined. As I began research and taking upper-level courses with more challenging labs, I started realizing it wasn't any one or two sects of science that I loved—it was the interaction between all of them. I am constantly studying the miniscule details I need for class, but that knowledge is not what will come to mind when I reflect back on the defining moments of my intellectual career. No, I am very certain when I think back on my academic time at Hendrix I will be taken right back to days when the details of science collided, such as the day I finally realized what "energy" is and the cascade of overwhelming epiphanies about how it is transferred and its key role in functions of cell biology and chemistry I had learned a thousand times.

The bridge between physical and biological concepts is often overlooked, but the budding field of Biophysics offers the opportunity to further understand biological mechanisms from a more quantitative and physical standpoint. Contrary to what one might be led to believe by its name, it requires extensive knowledge outside of just biology and physics. For example, a question biophysicists are currently asking is, "How are tiny molecules in our environment detected by a sense organ and converted into electrical impulses that provide the brain with information about the external world?" For questions like this, an understanding of

molecular interaction (chemistry) and mathematical approaches is essential to being able to make connections about how mechanisms of biological systems work, because of the way all sciences build off of each other. A molecular biophysics major would require courses within physics, mathematics, chemistry, and biology all beyond a general or introductory level to have enough knowledge and exposure to begin thinking about questions like this. This extensive knowledge and greater exposure will lead to many more days of "science colliding" and enable me to begin thinking about questions like this.

The field of biophysics is creating new ways to analyze, describe, and predict biological behavior from molecules to ecosystems and beyond. Undergraduate degrees in biophysics are currently only offered at some of the most competitive colleges, but its rapid growth within laboratories and industry in the last decade has pushed many schools to begin trying to build departments around it, creating many new positions for young biophysicists. The requirements I have chosen for a molecular biophysics major are parallel to the requirements to receive a B.S. in biophysics at Duke University, Columbia University, and Johns Hopkins University with a stronger focus on molecular studies, while also considering prerequisites of a variety of graduate programs of biophysics.

Molecular Biophysics

15 courses as follows:

Physics (4)

- PHYS 230 General Physics I (Calculus-based)
- PHYS 240 General Physics II (Calculus-based)
- PHYS 305 Vibrations and Waves
- PHYS 315 Modern Physics

Mathematics (3)

- MATH 130 Calculus I
- MATH 140 Calculus II
- MATH 260 Differential Equations

Chemistry (4)

- CHEM 110 General Chemistry I
- CHEM 120 General Chemistry II
- CHEM 240 Organic Chemistry I
- CHEM 250 Organic Chemistry II

Biology (2)

- BIOL 150 Cell Biology (introductory-level course)
- BIOL 250 Genetics

Others (2)

- Two electives from

  CHEM 320 Thermodynamics and Chemical Kinetics
  CHEM 330 Biological Chemistry
  CHEM 335 Advanced Biological Chemistry
  BIOL 325 Cellular and Molecular Neuroscience
  BIOL 340 Microbiology
  BIOL 465 Molecular Evolution and Bioinformatics

Senior Capstone Experience:

The student will explore biological functions whose mechanisms are described in a way that reflects the interdisciplinary nature of two or more sciences within science literature. This could be anything from the function of an entire organ to the mechanisms of photosynthesis. The student will submit a research paper, minimum of 10-pages, and give an oral presentation evaluated by the major committee describing one of these biological functions. A final capstone grade will be the average of all grades. This capstone will not count for course credit.

Main Advisor: Dr. Hales

Advisor: Dr. Tinsley