

## Michigan Biophysics: Vision and Value

Biophysics is the quantitative hub that links biology and biomedicine to the disciplines of physics and chemistry. Research in the field of biophysics involves multi- and inter-disciplinary activities that aim for marriage of the mathematical rigor from physics and chemistry with the complexity of biological organisms to discover the principles that underlie the workings of life. These research activities span the length and time scales of cellular processes and their constituents, from atomic level exploration of the structure, function and properties of individual molecules or complexes using methods of X-ray crystallography, NMR, single molecule technologies and cryogenic electron microscopy to whole cell level organization and response to external stimuli. The thread that binds investigations on these disparate scales of length and time is the common language of quantitative science and the quest for organizing principles that will guide our deep understanding of biological processes and the correction of aberrant processes that lead to disease.

At the University of Michigan, our tradition of innovation and creativity in Biophysics goes back to late 1930s and has played a defining role as Biophysics has emerged as a field. Our faculty has always represented the broad spectrum of research activities that define Biophysics as a discipline. In 2007, Biophysics at UM took the bold step of creating one of the few independent undergraduate programs in Biophysics in the country, and moved from a Research and Graduate Program within the Office of Research to an enhanced program within LSA. With this move we created an innovative and extensive undergraduate program in Biophysics to complement the excellent research and graduate program that existed, and set about defining a curriculum and research experiences to prepare our undergraduates for the emerging era of quantitative biology and the attendant careers it would present. At present our faculty numbers 54 (12 core and 42 affiliated) with research interests that embrace modern quantitative discovery in biology and biomedicine through biophysical methods and models.

Students of Biophysics learn how to think quantitatively about biological processes, how to probe and explore such problems utilizing state-of-the-art laboratory equipment, technologies and modeling. They develop models: sophisticated mathematical models that necessitate computer simulation to explore; analytical models that correlate and align experimental data based on fundamental principles; or conceptual models that inform and direct new experimentation. Students, at both the graduate and undergraduate levels, work in our laboratories utilizing this equipment and methods to advance our understanding of a range of biological and biomedical phenomenology. Once completing their studies in Biophysics, our graduate and undergraduate students find themselves prepared for careers that involve the keen sense of quantitation required to ask questions in our every increasing data-centric world. These careers may take them further in academia, with advanced degrees or teaching and research careers at universities, into biotechnology or “big pharma” developing our next generation medicines and treatments, into law as patent or cooperate lawyers, into medical school to train to become physicians in the evolving big data era of medicine, or into data analytics or any other career where strong quantitative skills are valued and required.

Our faculty navigate the avenues of pedagogy that prepare our students for their futures, while at the same time pushing forward the boundaries of quantitative knowledge of living systems. We strive to keep this enterprise moving through the maintenance of large centers, such as the NMR facility or the SMART Center for single molecule investigations, which serve the entire University of Michigan community with the newest equipment and technologies, and through the currency of the equipment in our research laboratories, shared facilities and teaching laboratories.



## Opportunities for Donors

Through gifts from alumni and friends of the Biophysics Program, we seek the vital support that enables us to continue this tradition of learning and research, development of innovative programs and the pursuit of new initiatives. We value every gift to our program and each makes a difference in the ability of Biophysics to create and maintain the unique opportunities that make a difference to our students and faculty. Our priorities in the Biophysics fund-raising campaign include:

### Endowed Professorship in Molecular Biophysics

#### **\$2.5M endowment**

This endowed professorship would be utilized to recruit an established scholar with interests broadly in the investigation of biological phenomenology at the molecular level.

### Graduate Fellowships in Biophysics

#### **\$10,000 to \$50,000 annually for each**

- Graduate Fellowship in Computational Biophysics
- Graduate Fellowship in Molecular Biophysics
- Graduate Fellowship in Biological Physics

Proceeds from this fund would provide support to graduate students entering the graduate program in Biophysics. Contributions would support opportunities for graduate students to integrate into the department culture by coming to the department in the summer prior to their first year for an intensive research experience. Emphasis would be placed on recruiting students to further expand the diversity of our graduate cohort.

### Summer Undergraduate Research Fellowships

#### **\$200,000 endowed; \$7,500 annually per student**

Research experience as an undergraduate is essential for students who desire admissions into the most elite graduate programs and who seek jobs in biotechnology and related quantitative industries linked to biology. All of the funds associated with this program will provide support to LSA Biophysics majors taking part in summer research opportunities in Biophysics.

### Innovation Fund

#### **\$1M to \$5M endowed**

This endowed fund would ensure flow of discretionary resources to be used as seed money in support of research innovations and the integration of new quantitative technologies into classroom pedagogy.

### Biophysics Strategic Fund

#### **\$20,000 to \$50,000 annually**

An undesignated expendable gift that would be utilized to ensure the continuing success and growth of Biophysics. The Biophysics Strategic Fund would allow us to meet unexpected needs and challenges as they occur, including such issues as:

- See funding for new faculty research and innovative research projects
- Research and shared facility lab maintenance and upgrades
- Purchase and repair of major instruments for the teaching and research laboratories