Why Consider Biophysics?

Are you interested in developing cures for disease, finding scientific solutions to fight global hunger, experimenting with and designing cutting-edge technologies, or solving countless scientific mysteries? Then biophysics may be the right field for you. In order to solve these and other problems, biophysicists work within and across a variety of disciplines including:

- BIOCHEMISTRY
- STRUCTURAL BIOLOGY
- NEUROBIOLOGY
- NANOTECHNOLOGY
- COMPUTATIONAL BIOLOGY
- MATERIALS SCIENCE
- SYSTEMS BIOLOGY
- COMPUTER SCIENCE
- CHEMISTRY
- ENGINEERING
- MATHEMATICS

Biophysics may be the field that gives you the tools and expertise to answer the research questions that you find most fascinating.

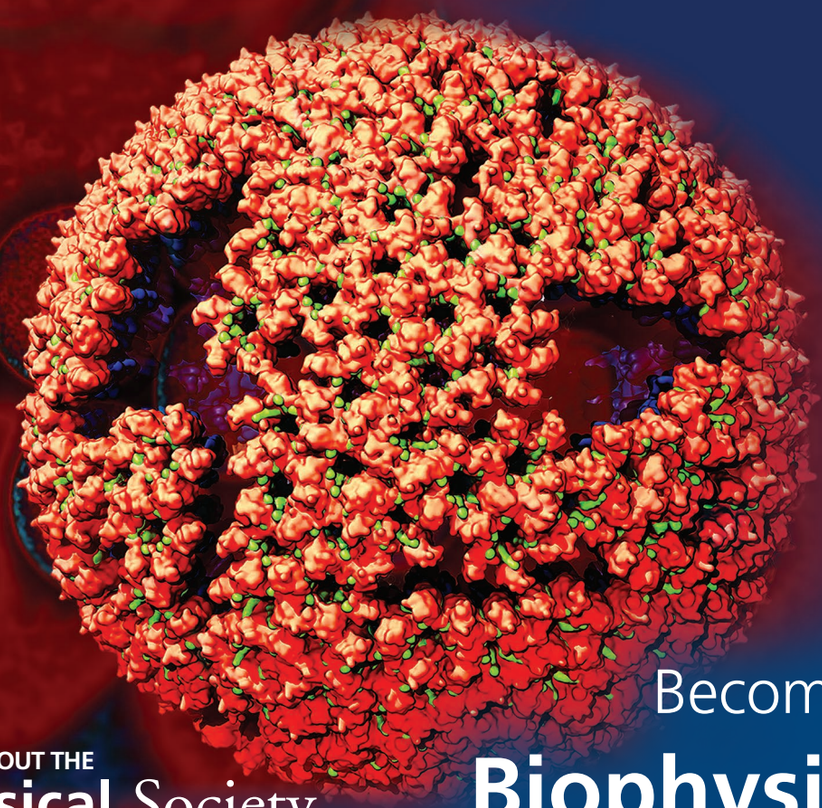
Consider biophysics as the next step in your scientific journey.

LEARN MORE ABOUT THE

Biophysical Society

www.biophysics.org

BRIDGING THE PHYSICAL SCIENCES AND BIOLOGY



Becoming a Biophysicist

Biophysical Society

What is biophysics? And why is it a driving force behind modern biological research?

Biophysics is the field that applies the theories and methods of physics to understand how biological systems work.

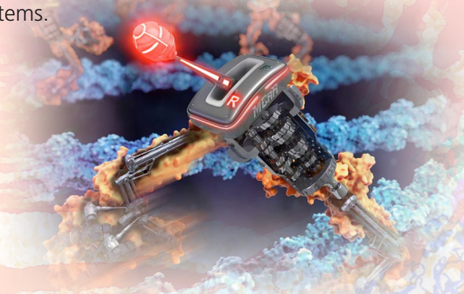
What do the laws of physics, such as those that define forces or energy, have to do with biology? These laws and concepts are essential to unraveling complex biological questions such as how plants extract energy from sunlight and how changes in a protein's shape affect its function. Biophysics has been critical for building many tools that are used every day in science and medicine such as DNA sequencers and imaging technology, including X-ray machines and MRI scanners. In fact, a specialized X-ray technique developed by biophysicists was used to discover the structure of DNA in 1953.

Biophysics has contributed to breakthroughs in microscopy, including the development of electron and atomic force microscopy and fluorescent imaging techniques—techniques that have revealed the structures inside of cells and are critical to present-day research.

What Biophysicists Do

MOLECULAR MOTORS AND IMAGING

Biophysicists study how microscopic machines facilitate movement of cargo (like proteins, neurotransmitters, or hormones) around a cell. Biophysicists developed the tools for microscopic fluorescent imaging and analysis of the signaling networks inside cells to understand intracellular systems.

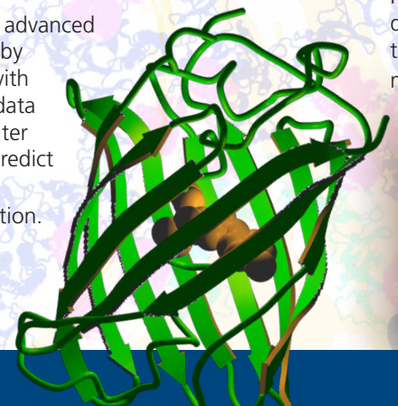


BIOLOGICAL STRUCTURES

Biophysicists have been integral to the development of methods and tools for determining biological structures, especially X-ray crystallography, mass spectrometry, and nuclear magnetic resonance.

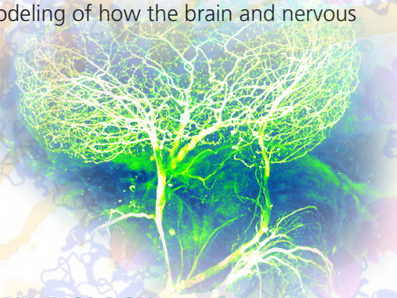
PROTEIN STRUCTURE AND MODELLING

Biophysicists have advanced structural biology by using databases with protein structure data to develop computer models that can predict structures from sequence information.



NEUROBIOLOGY

Biophysicists research neurobiology at a molecular level, using biophysical approaches to understand how these cells receive and transmit signals and orchestrate long-range communication. Biophysicists have been instrumental in developing neural networks; these computer-based models can be used for the theoretical analysis and modeling of how the brain and nervous system work.

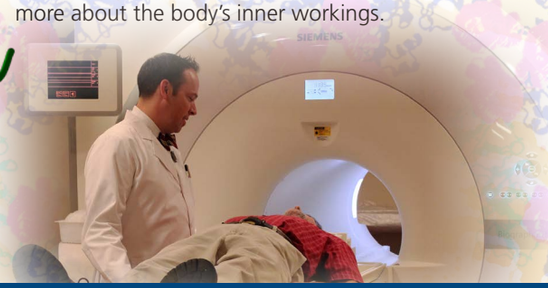


COMPUTATIONAL BIOLOGY

The rapid collection of vast quantities of genomic, proteomic, and exome data has required the development of new nucleic acid sequencing and proteomic technologies rooted in biophysics. Scientists have also developed computational techniques to analyze and extract useful information from large data sets and make unprecedented observations within large population samples.

IMAGING AND MEDICINE

Biophysicists have developed sophisticated diagnostic imaging techniques including MRIs, CT scans, and PET scans. Biophysics continues to be essential to the development of even safer, faster, and more precise technology to improve medical imaging and teach us more about the body's inner workings.

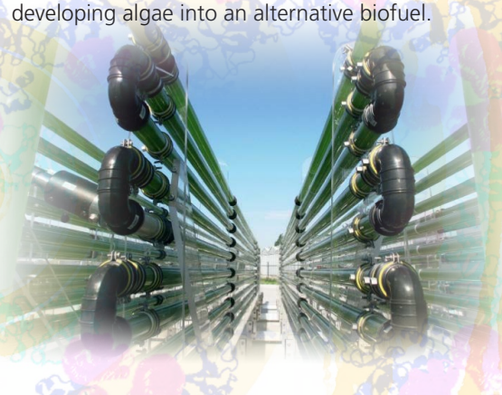


PRECISION MEDICINE

This era of "big data" has ushered in a new way of thinking about medical treatments. Researchers now have the tools to rapidly sequence individual genomes and apply this information to the customization of medical treatment. This "precision medicine" approach will continue to advance as more genomic data can be linked to certain diseases. Biophysics is critical to integrating systems biology, genomics, and proteomics data into information that can guide diagnostics and medical treatment.

ECOSYSTEMS

Biophysicists study aspects of the environment; they study atmospheric pollution, how ocean mixing and turbulence affect oceanic ecosystems, and are at work developing algae into an alternative biofuel.



BIOENGINEERING, NANOTECHNOLOGY, AND BIOMATERIALS

Biophysicists work on a wide range of nanotechnology and biomaterials research, from the development of microfluidic devices, like DNA chips, and tissue engineered constructs (which enable tissues to grow new organs for implantation), to developing smart biomaterials and better drug delivery systems.

How to Become a Biophysicist?

If biophysics sounds like a good fit for you, below are some ways you can prepare to enter the field.

UNDERGRADUATE PREPARATION

Although all science majors can pursue biophysics, it's important to build a strong undergraduate foundation by taking biology, physics, chemistry, and mathematics courses and some advanced courses in fields like biochemistry and neurobiology. As an undergraduate, take all opportunities to gain research experience. Finding work in a lab doing biophysics research will not only give you experience in the day-to-day life of doing research, but it will give you an invaluable perspective of what's happening at the cutting edge of biophysics and help you discover what really stokes your curiosity.

GRADUATE PROGRAMS

Although there are many biophysics departments, many biophysics graduate programs are interdisciplinary programs housed in physics departments or different biological science programs. Biophysics research mentors can be found in almost any science department including biochemistry, pharmacology, chemistry, bioengineering, computational biology, and neurobiology. Most graduate training programs in biophysics offer a PhD degree, although a Master's degree option exists in some institutions.

Opportunities

Students with training in biophysics have unlimited career possibilities and pathways, including traditional academic research, working in industry from small tech start-ups to large biotechnology companies, intellectual property law, science writing, or science policy. The quantitative and interdisciplinary nature of biophysics provides excellent training for careers inside and outside of the lab, and the breadth and diversity of the biophysics community offers students opportunities to explore many career options.

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