



BIOPHYSICS IS VERY MUCH IMPORTANT NOW-A-DAYS: WHY?

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ABSTRACT

In this paper, I have discussed about the important of Biophysics Right Now. Biophysics is a Bridge between Biology and Physics, What is Biophysicists study?, How essential is Biophysics to Progress in Biology?, Biophysicists are Discovering How Protein Work?, Biophysics Revealed the structure of DNA, Contribution of Molecular Biophysics, Scope of Biophysics Research, Bio inspired Materials and its applications.

INTRODUCTION

What is Biophysics?

The term "Biophysics" was originally introduced by Kar Pearson in 1892 [1]. Biophysics is an interdisciplinary science using methods of, and theories from, physics to study biological systems. Biophysics spans all scales of biological organization, from the molecular scale to whole organisms and ecosystems.

Biophysical Research or Biophysics is a Bridge between Biology and Physics:

Biophysical research shares significant overlap with biochemistry, nanotechnology, bioengineering, computational biology and complex systems biology. It has been suggested as a bridge between biology and physics [1]. Biology studies life in its variety and complexity. It describes how organisms go about getting food, communicating, sensing the environment, and reproducing. On the other hand, Physics looks for mathematical laws of nature and makes detailed predictions about the forces that drive idealized systems. Spanning the distance between the complexity of life and the simplicity of physical laws is the

challenge of biophysics. Looking for the patterns in life and analyzing them with mathematics and physics is a powerful way to gain insights. Biophysics looks for principles that describe patterns. If the principles are powerful, they make detailed predictions that can be tested.

Why do Biophysicists Study?

Biophysicists study life at every level, from atoms and molecules to cells, organisms, and environments. As innovations come out of physics and biology labs, biophysicists find new areas to explore where they can apply their expertise, create new tools, and learn new things.

How Essentials is Biophysics to Progress in Biology?

Biophysics discovers how atoms are arranged to work in DNA and proteins. Protein molecules perform the body's chemical reactions. They push and pull in the muscles that move your limbs. Proteins make the parts of your eyes, ears, nose, and skin that sense your environment. They turn food into energy and light into vision. Protein repairs what is broken inside of cells, and regular growth [2]. They fire the electrical signals in your brain. They read the DNA blueprints in your body and copy the DNA for future generations.

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Review Article



Biophysicists are Discovering How Protein Work

To learn how a car works, you first need to know how the parts fit together. Now thanks to biophysics, we know exactly where the thousands of atoms are located in more than 50,000 different proteins. Each year, over a million scientists, and students from all over the world, from physicists to medical practitioners, use these protein structures for discovering how biological machines work, in health and also in diseases [3]. Variations in proteins make people respond to drugs differently. Understanding these differences opens new possibilities in drug design, diagnosis, and disease control. Soon, medicines will be tailored to each individual patient's propensity for side effects.

Biophysics Revealed the Structure of DNA:

Experiments in the 1940's showed that genes are made of a simple chemical-DNA. How such simple chemical could be the molecule of inheritance remained a mystery for biophysicists discovered the DNA double helix in 1953[2]. The structure of DNA was a great watershed. It showed single chemical could generate unique individuals and perpetuate their species. Biophysics showed how DNA serves as the book of life. Inside of cells, genes are opened, closed, read, translated, and copied, just like books. The translation leads from DNA to proteins, the molecular machinery of life. During the 2000's biophysical inventions decoded all the genes in a human being. All the genes of nearly 200 different species and some genes from more than 100,000 other species have been determined. Biophysicists analyze those genes to learn how organisms are related and how individuals differ.

Contribution of Molecular Biophysics:

Molecular Biophysics typically addresses biological questions similar to those in biochemistry and molecular biology, but more quantitatively. Scientists in this field conduct research concerned with understanding the interactions between the various systems of a cell, including the interactions between DNA, RNA and protein biosynthesis, as well as how these interactions are regulated. A great variety of techniques are used to answer these questions [2]. By drawing knowledge and experimental techniques from a wide variety of disciplines, biophysicists are often able to directly observe, model or even manipulate the structures and interactions of individual molecules or complexes of molecules.

A Variety of Techniques are Used to Visualize Structures:

Fluorescent Imaging Techniques
Electron Microscopy
X-Ray Crystallography
NMR Spectroscopy
Atomic Force Microscopy (AFM)
Small-Angle Scattering (SAS)

Conformational Change in Structure can be measured Using techniques such as dual polarization interferometry.

Scope of Biophysics Research:

Bimolecular Scale
Organimal Scale
Environmental Scale
Biophysics Research Overlaps With
Agro Physics
Biochemistry
Biophysical Chemistry
Bioengineering
Nanotechnology and System Biology

Bio inspired Materials for Self-Cleaning and Self-Healing:

Bio inspired materials are synthetic materials whose structure, properties are similar to those of natural materials or living matter. Examples of bio inspired materials are light harvesting photonic materials that mimic photosynthesis [4]. Biological systems have the ability to sense, react, regulate. Grow, and heal. Recent advances in material chemistry and micro-and nano-scale fabrication techniques have enabled biologically inspired materials systems that mimic many of these remarkable functions.

This issue highlights two promising classes of bio inspired materials:

Surfaces that can self-clean and polymers that can self-heal. Design of these surfaces is inspired by the hydrophobic micro-and nanostructures of lotus leaf. Self-cleaning and Self-healing materials have opportunities for commercial applications.

Applications of Biophysics:

Applications of biophysics depend on society's needs. It described and controlled diseases of metabolism, such as diabetes. Biophysics helped create powerful vaccines against infections diseases. Biophysics provided both the tools and understanding for treating the diseases of growth as cancers. It provides the life-saving treatment methods of kidney dialysis, radiation therapy, cardiac defibrillators, and pacemakers. Biophysicists invented instruments for detecting, purifying, imaging, and manipulating chemicals and materials [4].

CONCLUSION

Advanced biophysical research instruments are the daily workhorses of drug development in the world's pharmaceutical and biotechnology industries. Since the 1970's more than 1500 biotechnology companies employing 200,000 people have earned more than 60 billion dollar per year. Biophysics applies the power of physics, chemistry, and mathematics to understanding health, preventing disease and inventing cures.



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