

Preface

Biological sciences are the study of life and living organisms, their life cycles, adaptations and environment. "*Advances in Biological Sciences – A Practical Approach*" describes recent progress in various rapidly growing biological sciences, such as bioinformatics, genomics, metagenomics, proteomics, enzymology, agriculture and marine microbiology, bioremediation, medicinal chemistry, and nanotechnology. This book consists of a total of thirty one chapters, each of which has been contributed by highly qualified professionals (professors, assistant professors, scientists, postdoctoral fellows, and senior research scholars) in the respective fields of research.

The chapter on bioinformatics describes the analysis and interpretation of biological experimental data using online bioinformatics tools or software. The genomics chapter describes the step-by-step strategy for identifying the gene of interest in the newly sequenced bacterial genome. Recent advances in metagenomics-based approaches have revolutionized microbial ecology science and have led to the discovery of some of the new biocatalytic molecules. In addition, metagenomics is undoubtedly the key to the discovery of secondary metabolites that can meet the urgent demand for new medicines from natural sources.

Proteomics chapters provide an overview of appropriate experimental workflows for plant proteomics, suggestions to improve the extraction and preparation of plant protein samples. Further current proteomic analysis is underway to better understand intracellular pathogen survival and disease persistence. An overview of X-ray diffraction technique the working principle, the instrumentation, and its usefulness in the structural characterization of the protein has been detailed. This section describe the various types of lectin proteins from different microbial source and also describe their role and action mechanisms. The section on enzymology explains bioanalytical techniques; principles of various enzyme inhibition assay's parameters required to optimize enzyme testing; and analytical merit characteristics for enzyme testing and its applicability to real sample analysis. Further emphasis is placed on information on routine protocols, aimed at highlighting and better understanding some of the challenges faced during the enzyme characterization/purification studies.

The section on microbiology presents an overview of microorganisms that solubilize phosphates, recent progress and future challenges with halophilic archaea as a beacon for exobiology, the use of probiotics and their mechanisms to control aquatic pathogens, and recent new research findings on the control of plant pathogenic diseases through various quorum quenching strategies. The reader will also be briefed about the advances in microbial techniques for the recovery of phosphorus in sustainable wastewater management, advances in ectomycorrhizal research methods, and techniques for the mass production of fungal arbuscular mycorrhiza.

Some chapters describe the photocatalytic and microbial degradation of amaranth dye, biodegradation of seafood waste by bacteria associated with seaweed and the use of seafood waste for the production of ethanol, the production of Polyhydroxyalkanoates by microorganisms in extreme niches with a particular focus on the use of cheaply available waste materials such as carbon substrates for Polyhydroxyalkanoates synthesis.

Chapters on medicinal chemistry present the various analytical techniques for the extraction, purification, and characterization of metabolites from natural sources. Special attention is focused on a discussion on case studies involving isolation of marine, microbial, and terrestrial natural products with the help of suitable examples. Another chapter discusses the advances in bioceramics, their biocompatibility, classification, application, and further research on bioceramics. Latest advancement in application of various 3D reconstructed human skin models for the screening of natural chemical compounds and cosmeceutical potential have been included.

The aquatic science section discusses the advances in sampling strategies and analysis of phytoplankton and current strategies for the isolation and preservation of ecologically important marine protists. Further, some chapters describe the role of nanoparticles in advanced biomedical research with reference to drug delivery and anticancer therapy. For better understanding of the mechanism of DNA damage as well as regions of the genome that are prone to alteration, micronucleus test and the single-cell gel electrophoresis assay techniques are described with the latest modifications.

This book describes the updates on the methodologies and protocols being used by researchers in their routine experiments of biological sciences. Great emphasis has been given to the basic fundamentals and the latest techniques and methods in routine experiments. We have given equal importance to text and illustrations, therefore, sincere efforts have been made to support the text with clarifications and explanations with the help of flow charts, tables, and figures. The book is written in a clear and concise language to enhance the self-motivation of researchers.

The book will help graduate and postgraduate students to explore their research careers. In addition, recently updated information on various research fields and techniques in biological sciences will definitely benefit university professors, university lecturers, and scientists from different life sciences institutions worldwide.

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