

Basic Biotechnology

Biotechnology is one of the major technologies of the twenty-first century. Its wide-ranging, multi-disciplinary activities include recombinant DNA techniques, cloning and the application of microbiology and other cell culture technologies to the production of a wide range of goods from bread to antibiotics. It continues to revolutionise treatments of many diseases, and is used to provide clean technologies and to deal with environmental problems.

Basic Biotechnology uniquely combines biology and bioprocessing topics to provide a complete overview of biotechnology. It explains the fundamental principles that underpin all biotechnology and provides a full range of examples showing how these principles are applied; from starting substrate to final product. A distinctive feature of this text are the discussions of the public perception of biotechnology and the business of biotechnology, which set the science in a broader context. This comprehensive text is essential reading for all students and practitioners of biotechnology and for researchers in academia, research institutes and biotechnology industries.

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Edited by

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Preface to the second edition

It is some 14 years since the first edition of this book appeared. Much has happened to biotechnology in these intervening years. Recombinant DNA technology, which was just beginning in the mid 1980s, is now one of the major cornerstones of modern biotechnology. Developments in this area have radically altered our concepts of health-care with the arrival of numerous products that were unthinkable 20 years ago. Such is the pace of biotechnology that it can be anticipated in the next 14 years that even greater developments will occur thanks to such programmes as the Human Genome Project which will open up opportunities for treatment of diseases at the individual level. All such advances though rely on the application of basic knowledge and the appreciation of how to translate that knowledge into products that can be produced safely and as cheaply as possible. The fundamentals of biotechnology remain, as always, production of goods and services that are needed and can be provided with safety and reasonable cost.

Biotechnology is not just about recombinant DNA, of cloning and genetics; it is equally about producing more prosaic materials, like citric acid, beer, wine, bread, fermented foods such as cheese and yoghurts, antibiotics and the like. It is also about providing clean technology for a new millennium; of providing means of waste disposal, of dealing with environmental problems. It is, in short, one of the two major technologies of the twenty-first century that will sustain growth and development in countries throughout the world for several decades to come. It will continue to improve the standard of all our lives, from improved medical treatments, through its effects on foods and food supply and into the environment. No aspect of our lives will be unaffected by biotechnology.

This book has been written to provide an overview of many of the fundamental aspects that underpin all biotechnology and to provide examples of how these principles are put into operation: from the starting substrate or feedstock through to the final product. Because biotechnology is now such a huge, multi-everything activity we have not been able to include every single topic, every single product or process: for that an encyclopedia would have been needed. Instead we have attempted to provide a mainstream account of the current state of biotechnology that, we hope, will provide the reader with insight, inspiration and instruction in the skills and arts of the subject.

Since the first edition of this book, we sadly have to record the death of our colleague and friend, John Bu'Lock, whose perspicacity had led to the first edition of this book being written. John, at the time of his death in 1996, was already beginning to plan this second

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edition and it has been a privilege for us to have been able to continue in his footsteps to see it through into print. John was an inspiring figure in biotechnology for many of us and it is to the memory of a fine scientist, dedicated biotechnologist and a remarkable man that we dedicate this book to JDB.

Preface to the third edition

From antibiotics and production of other health-care products to waste treatment and disposal, biotechnology continues to hold our attention. The breadth and scope of biotechnology continues to increase: each decade sees significant new advances across a wide range of topics. From the first edition of this book to the second edition took 14 years; from the second edition to this one has taken only five. The rapid pace of developments in molecular biology and genetics, and in their applications to biotechnology, ensures that progress in microbiology, animal and plant cell technology for the furtherance of our well-being never slackens. Biotechnology continues to be a world-driving force for the production of a whole range of products as well as being vitally important as a process technology for the care of the environment. The expectations are that biotechnology will remain as one of the leading scientific and industrially linked endeavours for at least the first half of this present century. Its contribution to our health, welfare, food and drink will, in fact, continue for as long as civilisation continues, such is the importance of biotechnology.

This new edition of *Basic Biotechnology* reflects these key developments in our subject but, at the same time, this new edition consolidates our knowledge of those fundamental principles of science and engineering that are vital to an understanding of the subject at its basic level. New chapters have been included on several topics both in the fundamentals and principles section as well as in the practical applications section; most of the other chapters have been extensively revised and all have been up-dated.

All our authors are internationally known for their contributions to biotechnology; all are exceptionally busy people and we therefore thank them most sincerely for taking time out to write their various chapters – both new and revised. Our task as editors has therefore been a rather easy one: curtailing a little too much detail here, or asking for clarification of a point, is about all we have had to do. Equally important is the enthusiasm of the publishers for this new edition. Their input in helping to produce a highly improved format, for what is already a highly regarded and popular book, is to be applauded. Obviously our publishers, like the purchasers of this book, know a good book when they see one.

We trust that this new edition adequately reflects the current status and trends in mainstream biotechnology. Given the diversity of biotechnology it will be an impossible task to cover every aspect of the field in one volume. Nevertheless, we feel that the major aspects of the subject are covered herein.