

Basic Biotechnology

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S Ignacimuthu
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S Ignacimuthu has expertly and compactly packed into one lucid exercise the multifarious topics that we have today come to understand as biotechnology. From the techniques of genetic engineering and its applications, through plant and animal cell culture, agriculture and industrial biotechnology, Ignacimuthu takes his audience into the subjects of gene transfer, healthcare applications and pollution control, all of which have benefited by the advent of biotechnology.

The source of the material is standard and is from well known textbooks written by authorities in their respective fields. In addition the excellent illustrations from these sources go a long way in enhancing the understanding of the reader. The author is to be complimented for very effectively abridging these extensive topics into highly readable material. It is pleasing to see the historical development of every field set down in perspective as he unravels each subject. For example, he describes how the discovery of DNA uptake by bacteria laid the

foundations for the present day sophisticated manipulations practiced by the genetic engineers. The topics are brought up to date with references to very recent developments in each field.

Without doubt, the best chapters are those on plant biotechnology, reflecting the author's familiarity with this field. One cannot but feel on reaching the end of the book that the future of our planet lies in our plants. The unique genetic systems available in plants and the manner in which they have been exploited have been brought out admirably.

The author has painstakingly compiled a valuable list of reading material at the end of each chapter that permits the interested student to pursue whichever chapter captures his or her fancy at greater depth. These include textbooks as well as original articles from journals ranging from *Scientific American* to *Cell*.

My comments are not entirely laudatory. The book does have several errors in the text, a couple of which are cited here: on page 21, it states that to locate particular genes on fragments of a restriction map, Northern blotting can be used; on pages 44 and 47, it states that Southern blot analysis can be used to study expression of genes. Such errors and ambiguities need to be corrected.

The discussion on the ethics of biotechnological applications makes heartening reading. The author rightly

Biotechnology is a term said to have been coined in 1917 by a Hungarian farmer named Ereky. Fermentation by yeasts to produce alcoholic beverages, large scale production of antibiotics and vaccines are some of the familiar examples of application of biotechnology. Biotechnology as conceived initially was essentially an amalgamation of chemical engineering and microbiology. Inputs into the field have always been from observations made in the context of specific questions addressing naturally occurring phenomena; but biotechnology carries these further, to harness practical benefits.

The more recent advances in biotechnology are the results of our understanding of biological processes and their control at the molecular level, an area referred to as molecular biology. One of the important advances in this field which is relevant to biotechnology is the discovery of restriction endonucleases which cleave DNA at specific sequences. Using these enzymes along with a joining or a ligating enzyme, desired pieces of DNA can be brought together and made contiguous. This discovery has enabled the introduction of desired gene sequences into any organism and has led to the creation of a number of *designer* microorganisms in plants and animals. It is worthwhile to remind ourselves that progress in biotechnology is always an outcome of conceptual and technological advances in various disciplines like genetics, biochemistry and several other basic sciences.

The benefits of biotechnology extend from healthcare to pollution management. One example is the remarkable fact that biotechnology has made it possible to produce quantities of growth hormone required for treatment of dwarfism in a child for one year from a couple of litres of bacterial culture (grown for 6-8 hours) instead of the same being obtained from about 75 pituitary glands (got from the same number of human cadavers). In agriculture, genetically modified strains of nitrogen fixing bacteria are being tested for release. Pest control through toxin gene transfer to bacterial strains suitable for infecting plants and frost protection of crops through genetically modified bacteria are some of the other significant developments. It is however necessary to exercise caution while releasing genetically modified microorganisms into the environment. One of the many possible threats to the environment is the production of drug resistant strains of pathogenic organisms.

stresses the importance of preserving human dignity above all other considerations and advocates the practice of biotechnology within the framework of certain value systems.

To conclude, it is my opinion that this excellent book should be added to the list of prescribed textbooks in an essential course

on biotechnology for students of undergraduate programmes in all biology streams.

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