BOOK REVIEWS

Genetic Engineering Fundamentals: An Introduction to Principles and Applications

By Carl Kammermeyer and Virginia L. Clark, Marcel Dekker, New York, 1989, 261 pp., $45.00.

This excellent little book does a good job of describing the fundamental aspects of recombinant DNA techniques. It comprises 13 chapters and a brief update section, and includes a glossary of terms and index. The first six chapters are introductory in nature and describe the basic components of biological systems; they also contain nomenclature and structure, descriptions of procaryotic and eucaryotic cells, DNA, RNA, protein synthesis, enzymes, plasmids, viruses, and microbial hosts, including vectors.

The second seven chapters discuss recombinant-DNA techniques including cloning processes, sequencing techniques, genetic engineering methods, various activities by commercial concerns, technology and design, mammalian cells, and a few pages on precautions and regulations.

The first two chapters are a basic primer on the chemical structure of DNA and the features of procaryotic and eucaryotic cells including their essential differences. The third chapter entitled, "DNA and RNA and Genes," gets into the real meat of the book describing the history of DNA, genes, the configuration of a molecule, replication and its mechanism, mutations, thermodynamics, a description of RNA and its differences with DNA, tRNA, ribosomal RNA, cDNA, and the sequence of events for the syntheses of DNA, both in cells and by chemical synthesis. I felt that the chemical synthesis, which is a fairly complicated chemical process, was described very well in an easy-to-understand manner.

Chapter 4 deals with protein synthesis from the genetic code, formation of peptide bonds, growth of the protein chain, and differences in the way proteins are synthesized in procaryotes and eucaryotes.

The next two chapters briefly explain restriction enzymes and their mode of action, and the use of various organisms as hosts for recombinant DNA, including *E. coli,* viruses or phage, and viruses used to transfer DNA in eucaryotes. Finally, there is a brief description of *Bacillus subtilis,* as an example of a gram-positive procaryotic host.

Chapters 7 and 8 describe recombinant-DNA techniques, DNA sequencing, and hybridizing. I felt that these chapters were the best chapters in the book in terms of the clarity and the excellent description of the procedures involved in nucleotide sequencing. Both the Sanger and Coulson method and the Maxim and Gilbert process are described step-by-step so that the techniques involved are clearly and easily understood.

The next two chapters describe early genetic engineering activities in plants and provide a summary of commercial genetic engineering activities by companies such as Genex and Genentech. These chapters include the introduction of nitrogen fixation genes into yeast and the use of *Agrobacterium tumefaciens* as a vector for DNA transfer into plants, the modification of zein and the cloning of chromosomal DNA from plants and bacteria, and a few paragraphs on Ti plasmids. The list of genetic engineering activities by private companies include somatostatin, human insulin, human growth hormones, and the cloning of the various interferons. The production of synthetic vaccines and the use of monoclonal antibodies are briefly touched upon.

Chapter 11, entitled "Technology and Design," is a badly needed description of the integration between laboratory construction of genetically-engineered microorganisms and their scale-up and use in fermentation manufacturing facilities, including logistics and problems involved in scale-up, process design, processing steps, requirement for sanitation, equipment features, and characteristics including materials, instrumentation, and the use of immobilized cells with membrane reactors or fixed bed processors.

Chapter 12 describes the techniques used for genetic manipulation of mammalian cells, the treatment of genetic diseases, gene therapy, and nonrecombinant gene transfer. There is a brief treatment in Chapter 13 of precautions and regulations that were of concern at the time of writing.

The last chapter addresses one of the only, but great, shortcomings of this small book. This update section addresses the fact that this book was clearly written in late 1982 or 1983. It covers the developments in genetic engineering that occurred between the time the book was written and 1986, including literature and documentation on new developments, improvements in DNA synthesis, the discovery of Z-DNA, introns, gene probes, plant genetics, medical applications, gene therapy, and developing technology.

I enjoyed reading this book and felt that it adequately fulfills its role in describing the fundamentals of genetic engineering. I am sure that the authors are as frustrated as I that this book was not published in 1983 or 1984, soon after it was written. The material now seems somewhat dated and the book misses new developments, such as the polymerase chain reaction, the enzymatic activity of some RNA's, single-chain antibodies, and a number of other modern developments.

The book contains no more than usual editing mistakes, including repeated sentences and a little hyperbole by the publishers on the back cover, including a claim that this book requires no previous training or experience in biology. This book is too short to go into a great deal of detail about various biochemical activities involved in genetic engineering, and someone without a solid footing in biochemistry would find this book very difficult to follow. This book should certainly be purchased by libraries, but I doubt that it will find widespread acceptance with students, as it is too brief to serve as a primary text and too expensive to be a secondary reference source. I found this book to be well written and concise, and recommend it highly with the reservation that it was written in the early 80's.

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Errata

In a recent R&D note titled "Determining Ice Content of a Fine Ice Slurry from Density Measurements" (Dec. 1989, p. 2033), we used an erroneous equation (footnote to Table 2) which affects the range of validity of the constant molal volume assumption for electrolyte solutions. Therefore, the following corrections are made to the penultimate paragraph, p. 2034 and Table 2:

Electrolyte solutions are *not* well described for solute weight fractions >0.05 by the constant molal volume assumption embodied in Eq. 6. The specific gravity of freezing NaCl solutions can be determined from correlations provided by Chen (1987) and Munson (1980) and are shown in Table 2 (below) along with corresponding values calculated using $\alpha = 0.800$ in Eq. 6.

Millero (1970) reported careful measurements of partial molal volume of NaCl solutions which increase with concentration at 0°C. Apparently the drop in freezing temperature counters most of the effect of concentration on the solution density for freezing solutions since the variation indicated in Table 2 is much less than might be expected from Millero's 0°C data.

Table 2. Specific Gravity of Freezing NaCl Solutions

Wt. Frac. NaCl, w	Solution Sp. Gravity		Difference (Sp. Gr. − 1), %
	Pub. Corr.*	Eq. 6**	
0.001	1.000805	1.000801	0.5
0.01	1.008086	1.008064	0.2
0.05	1.04115	1.04167	1.3
0.10	1.08402	1.08696	3.4
0.20	1.17361	1.19048	9.3

*The equation derived from Chen and Munson is Sp. Gr. $= 1.0000 + 0.80497\,w + 0.36502\,w^2 - 0.015627\,w^3 - 1.16038\,w^4$.

**$\alpha = 0.800$, corresponding to $V^* = 0.0117$ dm$^3 \cdot$ mol^{-1}, was used in Eq. 6. Millero's infinite dilution NaCl molal volume of 0.0129 dm$^3 \cdot$ mol^{-1} corresponds to $\alpha = 0.780$.

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