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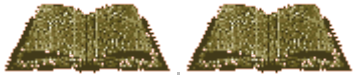

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AN EXCELLENT BOOK ON DNA TECHNOLOGY

DNA Technology - The Awesome Skill, 2nd Edition *by* I. Edward Alcamo
Academic Press, Harcourt Place, 32 Jamestown Road, London NW1 7BY, UK; xii + 348 pages: ISBN 0-12-048920-1. Library of Congress Catalogue card Number. 99-68792: Hardback edition, 2001: Price £39.95

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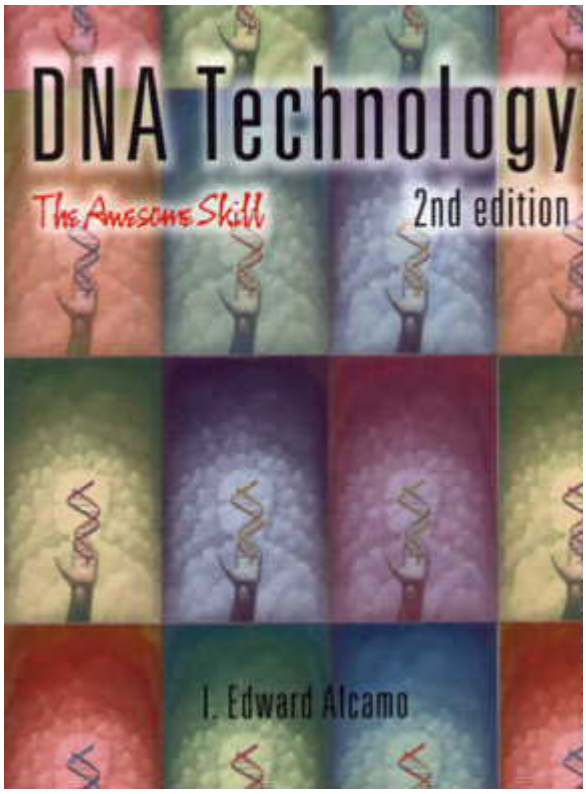


Let us start with an unusual paternity case which came to the fore in Spain in 1997. A woman gave birth to a pair of fraternal twins. The husband suspected her of infidelity and thought that he was not their father. One of the new techniques - DNA fingerprinting - was used to find out the paternity. To everyone's surprise, it was found that the husband was the father of one, while the father of the other twin was some other person! It was a very interesting case of *superfecundation*.

View this book on Amazon

Mentioned on page 217 of this highly interesting book, this case - among several others - highlights the extreme power of this new technique. Traditionally, cases of superfecundation have been discovered by the starkly different appearances of twins. For instance, there are a number of scientific reports from eighteenth and nineteenth centuries, where a woman gave birth to twins - one of them black and the other white. People could obviously smell something black at the bottom. Cases like these led scientists to theorize that these women must have released two ova at the same time, each of which got fertilized with a spermatozoa coming from a different person. Such a woman must necessarily have had intercourse with two different people at very short intervals. But at that time (eighteenth and nineteenth centuries), there was no surefire method to "prove scientifically" in a court of law that such an act had indeed occurred. The different appearances of the twins was the only "proof" of the woman's infidelity.

Come 20th Century, and blood groups were used as scientific proofs in these cases. Take for example a couple, both having 'O' Blood groups. If such a female gave birth - even to two rather similar looking babies - her infidelity could still be proved, if one of the twins had, say, an 'A' blood group. The woman was obviously having an affair with a person having an 'A' blood group. But what about the woman having an illicit intercourse with a man having an 'O' group? Blood tests would obviously fail.

This is precisely where the DNA technology comes in. And this book explains in great detail everything about this new technique. Written in a very clear and lucid style, this book is aimed at

an intelligent educated person, be he from a science or a non-science stream. I had fun reading this book, and I believe everyone would enjoy this book as much as I did.

I. Edward Alcamo



I. Edward Alcamo, the author, is already thinking about the third edition of this book, and would like to enlist your help. If you spot any related articles in your community newspapers or magazines, you may want sending copies to him. He can be reached at the *Department of Biology, State University of New York, Farmingdale, New York 11735*. His E-mail is alcamoie@farmingdale.edu. In the adjoining photograph, he is seen with James D. Watson (on your right, with gray hair), co-discoverer of the structure of DNA. You can click picture to enlarge it.

The book has three major sections, each section highlighting a different aspect of DNA technology. The first section, comprising of three chapters is rather basic in approach. It traces the discovery of the laws of genetics by Gregor Mendel, the realization that DNA is the hereditary material, the development of the Watson-Crick model of DNA and so on. The second section, comprising of two chapters summarizes the development of thought leading to DNA technology and recounts some of the technical problems requiring attention before DNA technology can bear fruit.

The third section comprising of the remaining seven chapters is perhaps the most "juicy" portion of the whole book. I perhaps found it most juicy, because there were so many things in this section that I did not know before. What for instance are DNA vaccines (Page 147)? What are antigenic antibodies (page 148-149)? What is a DNA chip (page 160-161)? Who is (or was) the Mitochondrial Eve (page 226)? May be you would like to read the book to know the answers to these questions.

The book has one of the most astounding dedications that I know of. It has been dedicated to the bacterium *Escherichia coli*! And why not? As the author very rightly says in his dedication, *E.coli* has been the hammer and nail of DNA technology. Reading through this book, you get to read a

number of experiments done on this bacterium, which ultimately resulted in a better understanding of DNA and its working.

The book explains several important concepts by giving good analogies. I found some of the sentences so striking, I thought they could be used as good quotes in other DNA books. Take for example this question. What does the human genome project involve? How difficult it is? Probably you imagined it was difficult, but never had a clue how difficult it was. Now read this analogy which appears on page 292. Take six complete sets of *Encyclopedia Britannica* and shred them on the floor. Now pick up the pieces and try to reconstruct the books? That's how difficult the human genome project was! Okay so now you know.

...Take six complete sets of Encyclopedia Britannica and shred them on the floor. Now pick up the pieces and try to reconstruct the books? That's how difficult the human genome project was!...

As I said earlier, the book gives several interesting sentences, which could very well be used as quotes. They serve to keep the interest of the readers alive in the material. They are too numerous to mention here, but I will just mention one, to let you know what I am talking about. On page 86, the author gives us an observation by a member of the scientific media, "Biotechnology used to be BBC (before Boyer-Cohen); now it is ABC (after Boyer-Cohen)." For the uninitiated let me give some background leading to this interesting quote. In early 70s, scientists were making rapid advances in the understanding of DNA. Sometime in 1973, two scientists Herbert Boyer and Stanley Cohen did a remarkable series of experiments. Cohen had developed two plasmids named pSC101 and pSC102. Plasmids, incidentally, are closed loops of DNA, which are found only in lower organisms (such as bacteria) and not in higher organisms (such as man). They lie separate from the main DNA material of the bacteria, representing just about 2% of the total genetic information of the organism. They contain from a dozen to several hundred genes, as compared to the main DNA material which contains several thousand genes. The function of plasmids is not entirely clear; indeed bacteria can afford to lose them without significant harm.

The Nobel Laureate Stanley Cohen, and his plasmid pSC101. It was his experiments with plasmids such as these, which led to an era of ABC (After Boyer Cohen). These photographs appear on page 84-85 of this book



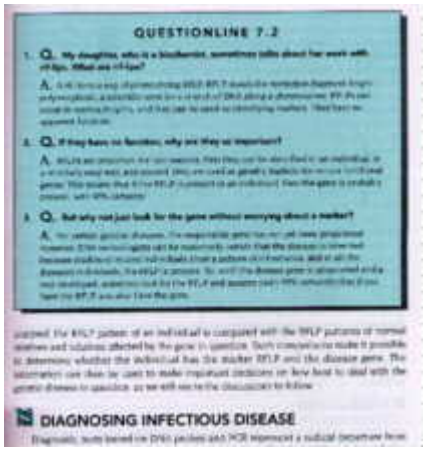


Stanley Cohen inserted some interesting genes in some plasmids. In pSC101 (short for "plasmid Stanley Cohen") for instance, there was a gene for tetracycline resistance, and in pSC102 for kanamycin resistance. When the two plasmids were combined and introduced in an organism, it showed resistance to both organisms. The two scientists then went ahead and inserted a frog (Xenopus laevis) gene in one of the plasmids, and sure enough the bacterium E.coli was producing frog proteins. It was these experiments which led a media person to make the above remark. And

by the way, this is just one of the several experiments (described in this book) justifying the dedication of this book to this tiny organism.

I can not end this review without mentioning some of the special features this book has. There are several of them, but I will mention just a few. Each chapter opens with a "Chapter Outline", which sets the stage - so to say - for the chapter. There is a section called "Looking Ahead". It presents several broad objectives that the reader can attain by reading the chapter. Pronunciations of several difficult terms is given in the margins. How do you pronounce Escherichia? Is it esh'er-ish'e-ah or is it esh'er-ik'e-ah (page 71)? How do you pronounce phosphorothioate (page 135)? How do you pronounce Xanthomonas (page 253)? Well, if you want to pronounce them correctly, just look at the margins of the pages where these terms appear, and you will know the correct pronunciation. It is just like having a teacher at your elbow.

An example of a Questionline, which the author uses with great effect throughout the book. This questionline (7.2), is the second such feature appearing in chapter seven. The questionline is the one which appears in the green colored box. The text in white is the main reading material. This questionline appears on page 163 of this book


QUESTIONLINE 7.2

DIAGNOSING INFECTIOUS DISEASE

Then there are meanings of difficult terms that have been explained right where the terms originally appear. These meanings also appear as a marginal glossary on almost every page. These marginal glossaries are "capped" by a "terminal glossary", which appears at the end of the book. Should any difficult term trouble you, chances are you will find the meaning right there in the margin. If you don't find the meaning there, surely you will find it here in the terminal glossary.

There is a very interesting "questionline" which appears three times in every chapter, each having three questions. This appeared a very very useful section to me. These questionlines serve to give additional information to the reader in sideboxes in the form of questions and answers. Each question and answer comprises of about 100-200 words, and throws additional light on the material you are reading. For instance, when you are reading about the Pharmaceutical products of the DNA technology (chapter 6), the following question appears in questionline 6.1 - "When will genetically engineered Factor VIII be commercially available for use against hemophilia?" (page 128). The author goes on to answer the question like this: "Factor VIII is a blood protein that contributes to the formation of a blood clot and, in doing so, prevents hemophilia. Synthetic Factor VIII, produced by DNA technology, is currently undergoing field trials and will probably be available for general use when you read this". Inserting this information might have interfered with the flow of main material running through the chapter, so the author has thought it prudent to put this information in the form of questions and answers in separate boxes. These questions can

be read on their own too, without referring to the main text at all. To me they appeared rather like pop-corn, which you can pop in your mouth at will.

...In my opinion, every intelligent person should read this book, whether he belongs to science or not...

There are books that are meant for scientists; there are books meant for lay people; there are books meant for educators. But for whom is this book meant? Well, if the simplicity, clarity and lucidity of the style of the book is anything to go by, I would heartily recommend this book to anyone and everyone who is interested in keeping abreast of the rapid march of science, especially the biomedical sciences. The author rightly says at one point that science is advancing at such a rapid rate, that it is usually difficult for authors to catch up with it. He has already embarked upon a third edition of this book, and I am eagerly looking forward to receiving a copy of that.

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