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Book Review

Gene Cloning and DNA Analysis: An Introduction, 5th ed.

Terence A. Brown.

Blackwell Publishing, Oxford. 2006. 386 pp. $69.95.

The textbook that became almost a classic in the field of molecular genetics and gene cloning deserved to be revised and published in this fifth edition. It is always curious to understand how such a book can survive in the ocean of special literature that has flooded the shelves of bookstores and libraries over the last 2 decades and, of course, observe which ones are written by the successful authors. The book's first edition emerged as an introductory text in 1986—at the time when recombinant DNA technology had matured and dominated, whereas new breakthrough techniques, like PCR and large-scale programs like the Human Genome Project were only at a conceptual stage. And only 5 years passed since Terry Brown had joined the University of Manchester Institute of Science and Technology as a postdoctoral researcher. As stated at The University of Manchester Web site, he has remained in Manchester ever since, becoming the UK's first Professor of Biomolecular Archaeology in 2000 and one of the group leaders at Faculty of Life Sciences and Manchester Interdisciplinary Biocentre. At present, Terry Brown is the author of a number of papers and books (including also *Genomes* and *Essential Molecular Biology: A Practical Approach*) and a prominent figure in archaeogenetics.

Twenty years separating the first and fifth editions—that is a tremendous leap in molecular biology and DNA technology. The stunning developments of this period include but are not limited to PCR, rapid increase of the sequence data in protein and nucleotide depositories freely accessible via Internet, bacterial artificial chromosome (BAC) library construction and BAC-contig physical maps, completion of the Human Genome Project and whole or in-progress genome sequences available for 200+ eukaryotic and 900+ prokaryotic organisms. Only one generation of DNA scientists have been eyewitnesses to these unbelievable advances. Being one of them, Terry Brown reflects in his book all these milestone changes in 20 years and focuses on major technologies that revolutionized molecular biology in the last quarter of the 20th century.

The book is logically divided into 3 sections describing theory and basic principles of gene cloning and DNA analysis (Part I), and their applications in research (Part II) and biotechnology (Part III). In a laconic fashion and just on one page of Chapter 1, *Why gene Cloning and DNA Analysis are Important*, the author reviewed the first century in the history of genetics, from 1865 (Gregor Mendel) to 1966 (early molecular biology advances). One more page is devoted to "a revolution in experimental biology" in 1971–1973 and follow-up developments that established recombinant DNA technology (or genetic engineering), gene cloning, DNA sequencing, and PCR. In the next 8 chapters, the author provides basic principles and specific details on plasmids and bacteriophages as vectors for gene cloning, DNA purification techniques, enzymatic manipulation of purified DNA, its introduction into living cells, cloning vectors for *Escherichia coli* and eukaryotes, analysis of gene clones, and, finally, PCR. However, I did not find in Chapter 8, *How to Obtain a Clone of a Specific Gene*, all the methods that are currently available for positive clone identification including overgo probing of genomic libraries, PCR screening of clone pools, and PCR testing of individual clones.

Part II contains descriptions of experimental techniques for studying gene location, structure, expression, and function, focusing on Southern transfer, in situ hybridization, DNA sequencing, Northern hybridization, RT-PCR, RACE, RNA sequencing, analysis of proteins and their interactions, etc. The most exciting achievements of modern biology are reviewed here, including genome mapping and whole genome sequencing, postgenomics, and studies of the transcriptome and proteome. On the other hand, the author elaborates on 2 DNA sequencing methods only, by Sanger-Coulson and Maxam-Gilbert, but does not mention pyrosequencing, now developed into a commercially available 454 technology, and some other new approaches leading to so-called $1000 sequencing.

In Part III, main applications of gene cloning and DNA analysis in biotechnology, medicine, agriculture, forensic science, and archeology are given. In this new edition, Terry Brown "tried to present an unbiased description of the public concerns" related to 3 new hot areas—pharming, gene therapy, and genetically modified crops. Bearing accidentally the surname of the Russian Royal family, I pricked my ears and paid special attention to the pages (Chapter 16, p. 350–353) devoted to the kinship studies by DNA profiling of the Romanovs' remains—the problem that is still debated in the circles of historians, forensic scientists, geneticists, and broader public. In the list of papers for further reading after this chapter, there is a paper by Gill et al. (1994), on which a synopsis of this story is based. Although this synopsis is quite interesting, the author erroneously mentioned 1917 (instead of 1918) as a date of the horrific regicide and murder of "various servants" (actually, only 3 servants were also shot), while leaving out some other known facts, new evidences including molecular ones, and questions raised by the opponents in Russia, United States of America and Japan regarding authenticity of the recovered bones (e.g., Zhivotovsky 1999; Nagai et al. 2001; Knight, Zhivotovsky, Kass, Litwin, Green, White 2004; Knight, Zhivotovsky, Kass, Litwin, Green, White, Mountain 2004; Stone 2004). Terry Brown also hurriedly assumed that the recently found remains of a boy and "girl"

could belong to the missing Tsar's children, Alexei and Maria. This assumption was even rejected by Pavel Ivanov, one of the major proponents of the official version, and was not verified by the assigned forensic expertise. I would suggest not to include this whole controversial example into the future editions of the book.

Another shortcoming of Part III is the presence of examples for plants only in the Chapter 15, *Gene Cloning and DNA Analysis in Agriculture*. Yet, Terry Brown known for his contribution in plant genomics and archaeogenetics excuses himself in *Preface to the Fifth Edition* that "the reader will forgive [him] the indulgence of describing [his] own research interests." In the section on *Sex identification by DNA analysis*, I would also like to see a brief description of sexing approaches for organisms like birds whose heterogametic gender is female (ZW). Hopefully, these small flaws will be improved in the future editions of the book.

Overall, the book content is elegantly illustrated and well organized in clear-cut chapters and subsections, often referred to other chapters where the appropriate material is presented in more detail or from a different perspective. There is a glossary and an index at the end of the book that help in understanding the basic terms and concepts and finding their appropriate context in the book. The author did not provide every single reference that is justified by the book's objective to be just a general introduction into the subject. However, there is a *Further Reading* section after each chapter that contains several key references, if one wants to choose to get more information. What is extremely useful, almost every reference is furnished with the short but distinct author's remark. From these *Further Reading* sections, I learned, for example, that K.B. Mullis wrote in 1990 for *Scientific American* a very entertaining account of how PCR was invented. The book can be recommended for biology students, teachers, and researchers as an introductory guide to a vast area of molecular cloning, DNA analysis, and genomics.

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