

*Book Review***Genomes 3**

By Terry A. Brown

750 pp., Garland Science, 2006, ISBN 0-8153-4138-5 £41.99 (paperback)

Genomes 3 sets out to present an understanding of genomes in a broad sense, working from a reductionist point of view through to wider application of this information. The first section of the book starts with a basic overview of DNA structure and how translation is regulated, developing into consideration of the importance of DNA sequence, through the 'transcriptome' and on to the 'proteome'. Links are then developed to explain how this increasing complexity offers insight into the 'metabolome'. Chapters 2 through to 6 focus on the various methods that can be used to unpick the complexity of the system, providing a useful reference resource to this area.

In part 2, Examining Genome Anatomies, the structure of the genomes of eukaryotes, prokaryotes and viruses are discussed, highlighting the similarities and differences between the classes of organisms. How this hardware translates into the operation of its software is dealt with in part 3. Regulation of Gene Expression is discussed, followed by consideration of how the translation machinery binds to DNA. This, and the following section on the detail of the synthesis and processing of DNA, are done in detail with a clear logical sequence. This section concludes with the mechanism of protein synthesis.

The cataloguing of the biochemical detail gives a good sense of where biological complexity is generated and the potential regulatory points in this process. The final chapter of this section begins to look at the way in which this regulation is used in biological systems, for example the role of homeotic genes and how positional information is used to control development.

In general, regulation is considered as a linear cause-and-effect system, and despite the complexity discussed earlier in the work, little emphasis is placed on networks of gene expression. Although systems biology is a relatively novel approach, it might have been useful to include some mention of bioinformatics methodologies that are starting to be unravel this complexity.

The final part is in some ways the most interesting, integrating the previous sections to describe the central processes driving evolution: How is variation generated and prevented (or encouraged) by mutation and recombination?

At the point where the reductionist approach might have delivered insight into real applications and contexts, *Genomes 3* unfortunately falls short. The coverage of these areas is not comprehensive and lacks the depth of the previous sections. While the mechanisms of genome replication are covered, the text is less convincing on how genomes evolve. Although gene duplication events are briefly covered, the process of evolution itself is not dealt with in

detail. This really is essential if the importance of the generation of variation is to be appreciated.

In general, plants are not well covered. The model plant *Arabidopsis* receives little attention despite its widespread use in research and its relevance to many of the topics here – indeed when it is mentioned it is incorrectly identified as a vetch!

One product of such gene duplications, synteny of genomes between organisms, is mentioned only in the glossary. Synteny reflects the outcome of replication and duplication of genomes during the evolutionary process and surely deserves greater consideration.

While gene transfer between species is briefly covered, there is no mention of the recent and ongoing debate about GM crops, which is both topical and highly relevant. Much academic effort and public debate has been expended on this and an opportunity has been missed. Additionally, in the plant context, the procedures of Tilling and Ecotilling are not present, these approaches allow transfer of genomic information from model species to those of economic importance providing a bridge between specific molecular approaches and real applications of genomic research.

The information coming out of the genome sequencing projects are dealt with unevenly, the human genome receiving almost all the attention, distracting attention from the progress being made in many other areas. While it may be that the rapid progress in this area does not allow a text book to be fully up to date, some indication of the current range of sequencing would have been useful.

The final chapter on molecular phylogenies is interesting as a case study, but due to the rapid accumulation of information in these areas, is not definitive. Clearly, use of humans as an example gives a good context but gives little impression of the wide diversity of genome research that is out there.

The book is well laid out and easy to use, with a logical overall structure gradually building levels of complexity. The diagrams are clear and add to the facilitating and understanding. The use of colour is judicious and is not distracting. Occasionally the language used falls into the teleological trap of implying design. It is already difficult enough to wean students away from such views, and given the current creationist controversies should emphasis should be discouraged.

The summaries at the beginning, and the objectives at the end, are useful, as are the variety of questions at the end of each chapter. A comprehensive and up to date references list is provided.

The title '*Genomes*' implies that this book will provide a synthesis of current information and then advance our understanding of both the regulation and relevance of genomes in general. However, while the molecular biology is detailed and clear, the more contextual chapters, illustrating the use of the

approaches outlined in the earlier sections, seemed superficial in comparison to the rigorous detail of the preceding chapters and thus the coverage is uneven.

Overall, *Genomes 3* is a useful book about molecular genetics and will no doubt be competing for the attention of students taking specialist courses in molecular biology. On balance, however, it falls short of delivering a comprehensive, integrated understanding of genome biology.

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