Controlling the cycle

Primers in Biology: The cell cycle. Principles of control. (2007). By David O Morgan. New Science Press Ltd., in association with Oxford University Press and Sinauer Associates, Inc. 297 pp. Price: £27.99. ISBN: 978-0-19-920610-0.

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The cell division cycle is an essential, rewarding and almost unavoidable subject for Cell Biologists. It is the central process by which cells duplicate, without which no organism could grow or develop, nor any species evolve. When out of control it often leads to diseases like cancer. Many different sub-disciplines of modern biology intersect with this subject, such as DNA dynamics, gene expression, cell signalling and structural biology. The recently published textbook by David Morgan, *The Cell Cycle*, addresses this subject with a fresh, contemporary and highly informative view. It is primarily aimed at advanced undergraduate students as well as graduate students and other researchers moving into this field.

This textbook is organised in a very systematic and transparent way, which characterises the *Primers in Biology* series of the publisher. *The Cell Cycle* is the second publication in this expanding series on key aspects of Molecular Biology. Each chapter is subdivided into basic building blocks of two-page sections. These sections provide self-standing modules of information that are useful both as a primary source of new information to the student, and as reference at a later stage. Each chapter is introduced at a basic level, and then moves into sections with increasing levels of specialist detail. It is very straightforward for the reader to catch up at different levels and move into the specialist topics quickly.

The Cell Cycle starts with a laudable and clear description of the model organisms used in cell cycle research, comparing budding and fission yeast with insect and amphibian embryos, as well as with mammalian cells. After this introduction, a detailed molecular discussion of the cell cycle control system follows. This focuses on the biochemistry of the protein kinases, phosphatases and proteolytic machineries that form the core of this system, and on how they build up regulatory networks. The stage set, the main body of the book addresses the control of key phases of the cell cycle in turn. It starts with an up-to-date discussion of chromosome duplication in S phase, addressing the control of chromosomal DNA replication and chromatin assembly. This leads into three chapters on the regulation of mitosis (entry, build up to metaphase and exit), followed by highly informative chapters on cytokinesis and meiosis. A long chapter on control mechanisms of cell proliferation and growth comes next. In here, G_1-phase transit and entry into a subsequent S phase are discussed first, cell growth, division and death follow. The penultimate chapter of the book addresses molecular mechanisms by which the cell cycle machinery responds to DNA damage, and how genome integrity is maintained during DNA replication and mitosis. The final chapter is dedicated to a discussion of cancer as a disease of cell proliferation, bringing into a common context the discussions of previous chapters. Suitably, it ends on current and potential approaches to detect and stop cancer, which is of course a major motivation and incentive for many of us to study the cell cycle in the first place.

This wide selection of topics discussed in *The Cell Cycle* is representative, very informative and stimulating. It is evident that the author has worked with specialists to achieve an insightful discussion in each chapter. As result, the selection of data figures and original references is pleasingly up to date. Consequently, new editions of this textbook would need to be published regularly as research progresses. It is somewhat surprising, however, not to see a reference in this textbook to classical cell fusion experiments, which were so instrumental for working out principles of cell cycle control. I was also hoping for dedicated sections on molecular mechanisms by which a cell can regulate exit from the cycle into the non-proliferative states of quiescence and/or differentiation, and how cells can re-enter the cycle. Perhaps we will see them in future editions.

A major strength of the book is the way that it is organised to ensure the effectiveness of the way that the information is conveyed. Information is presented in three parallel ways: main text, supporting conceptual diagrams and selected original research data. The main text is written clearly and concisely. It allows the reader to follow the argument through increasing levels of complexity, section after section, chapter after chapter. Individual sections of the book are very well cross-referenced with each other. The supporting diagrams are very clear and complement visually the content of the main text. Detailed legends provide additional information. The selected original research data add to this basic framework. On the one hand, they provide the reader with relevant original data, mostly up to date, sometimes classic, that provide real-life examples and lines of evidence. On the other hand, their legends also provide technical details of the relevant experiments, which point the way out of a textbook environment into a real-laboratory-working situation. The book also provides clear and very helpful overviews and comparisons of the different names for homologous genes and proteins in the different model organisms, thus pre-empting a lot of potential confusion. Finally, each section also provides clear definitions of key terms, and contains references to a selection of some recent relevant review and original research papers. Throughout the book, clear statements are made where current

knowledge ends, and where speculation begins. In my opinion, this didactical concept works very well.

The Cell Cycle is not an elementary textbook. It assumes that the reader is familiar with the principles of Molecular Cell Biology, and therefore complements and extends textbooks such as *Molecular Biology of the Cell* by Bruce Alberts and co-authors. For students of Cell Biology, *The Cell Cycle*, therefore, provides a very useful connection between basic material, usually encountered at an early stage of undergraduate studies, and original papers and reviews usually encountered at advanced levels. It may also be a valuable tool for students entering into the field of cell cycle research at the beginning of their graduate work, and as a convenient reference guide at a later stage.

In conclusion, I have enjoyed reading this textbook cover to cover. I have learned new things from chapters that lie outside of my own specialisation of chromosome duplication, and have made interesting new connections. As a University teacher and researcher, I can strongly recommend David Morgan's textbook to students with a background in molecular biology who are interested in the regulation of the eukaryotic cell cycle.

DOI 10.1002/bies.20586
Published online in Wiley InterScience (www.interscience.wiley.com).