

# Preface

The cell cycle is what needs to happen from the time one cell is generated at the end of a cell division for that cell to divide into two. To make two cells from one, all the parts of one cell are duplicated and segregated into two cells. In the last 50 years, there have been several excellent monographs on cell division. The overwhelming emphasis in most of them is on the replication and segregation of the cell's chromosomes. Endowing the next generation of cells with the correct genetic material is the primary task a dividing cell must accomplish. But focusing only on chromosomes is like watching a movie with a single actor. After all, chromosomes make up only a small fraction of the cells' parts. As it turns out, when and how cells make and segregate their other components, even large molecules, such as proteins and RNAs, or smaller ones, such as lipids in membranes, is crucial in itself. It also impacts when and how cells duplicate and segregate their chromosomes.

But how does one go about describing all that information without getting lost in a blizzard of gene names and regulatory pathways? The book tries the following:

- A brief history of the cell cycle and its prominent landmarks, looking at cellular parts that are easily seen to duplicate and segregate.
- Discuss in some detail "bulk" cellular components that also need to be duplicated and segregated. But this process of cell "growth" is amorphous, with no apparent beginning or end. And yet, cell "growth" is coupled with cell division in ways that profoundly affect how fast cells multiply.

- Take a short detour to the current methods of monitoring cell division and their shortcomings. For example, some of these methods may perturb cellular physiology and the normal coordination between cell growth and division.
- Learn about the master control system of the cell cycle.
- Examine how cell cycle switches are put together and how they are turned on and off.
- Looking at gene expression patterns in the cell cycle, or at what goes up and down and when.
- After all the above, then we can better describe how the genome is duplicated and segregated.
- More than an afterthought, we will see how some organelles are duplicated and segregated.
- Finally, the last act, cytokinesis, yields two cells from one.

But other related topics will not be covered (e.g., meiosis, prokaryotic cell cycles, cell cycle controls during animal development, some unusual cell cycles). Not because these topics are uninteresting or unimportant. To keep the book short and more accessible, it can only focus on the common, universal aspects of eukaryotic cell division. Although a serious effort was made to minimize their number, some protein names are necessary. The final tally came to slightly less than a hundred. A table with all the protein names mentioned in the book and their function is given at the end.

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