

Preface

The three years since publication of the Third Edition of *The Cell* in 2003 have been marked not only by rapid progress in many areas of cell biology, but also by revolutionary changes in some of the ways that molecular and cellular biologists are approaching their science. The human genome project introduced large scale experimentation to cell and molecular biology, together with the need for sophisticated computational approaches to analyze the vast amounts of data generated by genome sequencing. The field of bioinformatics developed in response to this need and has now become an integral part of our efforts to understand the molecular basis of cell behavior. The success of genomics has also spawned global experimental approaches in other areas and given rise to the new field of systems biology, which combines large-scale experimentation with quantitative analysis and modeling.

These changes in experimental approaches have been coupled with striking advances in several areas. Perhaps foremost among these, it has become apparent that microRNAs play widespread roles in regulating gene expression, the full biological significance of which remains to be discovered. Our understanding of stem cells has progressed enormously, together with the potential for using these cells to treat a variety of devastating diseases. Likewise, the last few years have seen major progress in the development of anticancer drugs that specifically target the abnormal proteins responsible for the uncontrolled growth of cancer cells.

The Fourth Edition of *The Cell* has been revised and updated to incorporate these advances and to highlight the exciting opportunities that mark the future of molecular and cellular biology. This edition not only provides an up-to-date review of genomics, but also includes major new sections dealing with the current challenges of bioinformatics, proteomics, and systems biology. The chapter on Cell Signaling has similarly been expanded to include a new section on signaling networks and quantitative analysis of signaling pathways within the cell. A new chapter on Cell Death and Cell Renewal provides expanded treatment of both programmed cell death and stem cells, including their medical applications. And the chapter on Cancer has been updated to cover the most recent developments in designer drugs.

While the text has been updated, the goals and approaches of *The Cell* remain the same as in previous editions. *The Cell* continues to be an accessible and readable text that can be appreciated and mastered by undergraduate students who are taking a first course in cell and molecular biology. Without sacrificing accessibility, we have also sought to ensure that *The Cell* is an intellectually satisfying and rigorous text that will engage students and enable them to appreciate the outstanding unanswered questions in our field. With this goal in mind, we have emphasized experimental approaches and the frontiers of current knowledge throughout the book. Each chapter contains one or two Key Experiment essays that describe a seminal paper and its background in detail, with the intent of giving students a sense of "doing science." Most chapters also contain Molecu-

lar Medicine essays that relate basic science to clinical applications. The Fourth Edition of *The Cell* also includes a new feature: each chapter contains several short "sidebars" designed to stimulate students by highlighting additional areas of interest and medical relevance. Finally, we have provided an updated and expanded set of questions at the end of each chapter, with answers to all questions at the back of the book. These questions are designed not only to facilitate review of the chapter, but also to stimulate students to think about the design of experiments and interpretation of experimental results.

The overarching theme of this and previous editions of *The Cell* has been to convey not only the facts, but also a sense of the excitement and challenges of research in contemporary molecular and cellular biology. We hope that *The Cell* stimulates our students to meet these challenges and contribute to the research upon which future texts will be based.

Acknowledgments

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