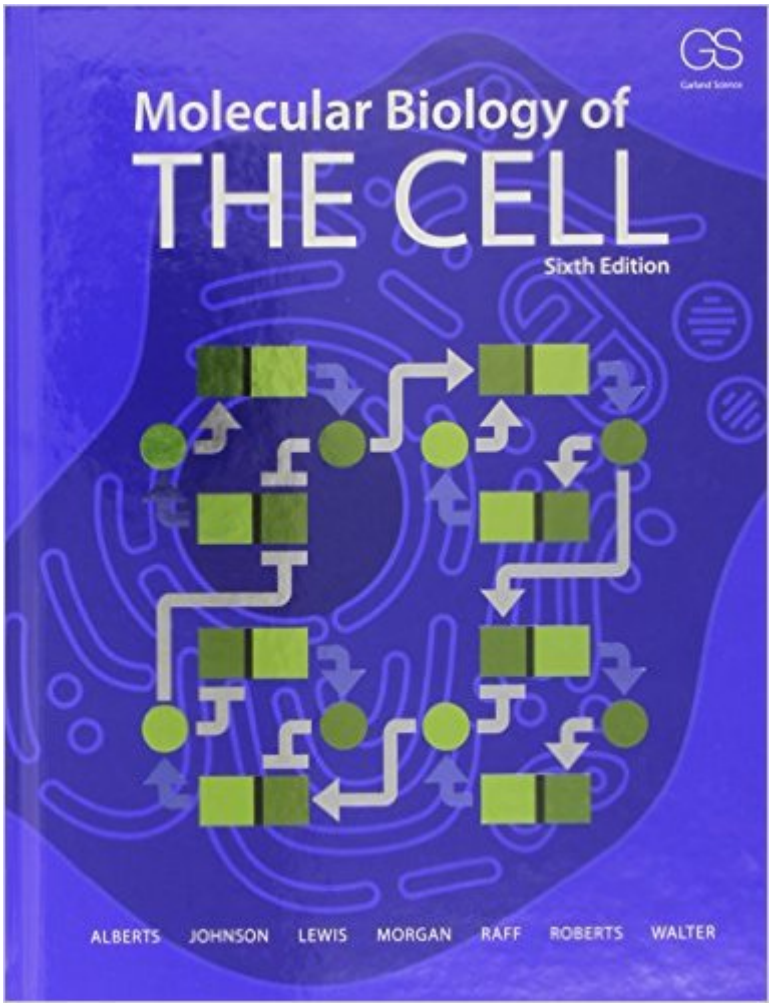
Molecular Biology Of The Cell



Synopsis

As the amount of information in biology expands dramatically, it becomes increasingly important for textbooks to distill the vast amount of scientific knowledge into concise principles and enduring concepts.As with previous editions, Molecular Biology of the Cell, Sixth Edition accomplishes this goal with clear writing and beautiful illustrations. The Sixth Edition has been extensively revised and updated with the latest research in the field of cell biology, and it provides an exceptional framework for teaching and learning. The entire illustration program has been greatly enhanced.Protein structures better illustrate structureâ “function relationships, icons are simpler and more consistent within and between chapters, and micrographs have been refreshed and updated with newer, clearer, or better images. As a new feature, each chapter now contains intriguing openended questions highlighting â œWhat We Donâ ™t Know,â • introducing students to challenging areas of future research. Updated end-of-chapter problems reflect new research discussed in the text, and these problems have been expanded to all chapters by adding questions on developmental biology, tissues and stem cells, pathogens, and the immune system.

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Customer Reviews

This review is based (mostly, see update at the end) on the Kindle edition of the book, which is a "Print Replica" edition which exactly matches the printed textbook (it’s essentially like a PDF of the entire book). For textbooks, even the most valuable (like this one) that I love and plan to keep for a long time, I now much prefer electronic versions for many reasons, not the least of which is that it’s

easier to hold up and read a tablet than a seven pound tome. You can also zoom in on text and figures as needed, and the illustrations are almost all in "vector" form meaning they stay sharp and detailed as you zoom in. You can also search the complete text of the book, do electronic underlining, set bookmarks, etc.Yes, the Kindle textbooks have DRM that restricts what you can do with it, but I find the Kindle restrictions less onerous than many, and in most cases they give you an option to "rent" textbooks for the duration of a class which might be as economic as buying a physical copy and then reselling it when you're done with it. But if you want complete freedom to resell what you buy, or maybe you just like the feeling of holding a real book in your hands, then the printed copy would probably be what you want. Note that I believe the physical version comes with a disc containing the movies and supplemental materials for the book (turns out it doesn't, see update below), but you can also find all of this free on the Garland Science web site if you buy an e-book version.So with that out of the way let's talk about the book! There are basically two groups of people who are likely reading this. Either you've had this book assigned as the textbook for a class or you haven't. If this has been assigned as a textbook, first make sure you're looking at the correct edition. This sixth edition is very different from the fifth (the authors point out that five million scientific papers were written since the previous edition) and you might *not* get away with buying a cheaper used previous edition. If your class is going into enough depth that it needs this book over something likeÂ Essential Cell Biology, 4th EditionÂ then chances are you really do need the correct edition. Also the sixth edition is brand new as of this writing, so make sure you're not being asked to get the previous (fifth) edition!This is one of my favorite textbooks of all time. A really good textbook is designed to prepare students to be practitioners in a field, not just to try to keep bored students awake and hold their hands through a class they really wish they didn't have to take. This is a great textbook and it's THE book to get if you want to learn as much about cell biology as is possible from one volume. It's also now entirely fresh and up to date (as of 2014), something absolutely critical in a field like Biology which advances daily. Everything in here is fascinating. If you think this stuff is boring then I feel sorry for you :) Life is cells, and this is "everything we know about how cells work" so it's directly applicable to an understanding of every (known) form of life, from bacteria to you and me. Even if your class doesn't go down into the depths and fine details, this is a great book to have for later self-study if this stuff interests you. This can be a textbook you keep for years and refer to frequently.This is also a surprisingly accessible work for those interested in learning about modern Biology on their own. If you're someone who is scientifically minded and wants to understand how life works, then most of what's in here is easily comprehensible and highly enjoyable. Unlike many fields, there aren't years of prerequisites needed to start the study of cutting-edge Biology. If this

were Physics, you would need to have had ten years of math and boring low-level physics before you could ever hope to begin to understand things like quantum mechanics or the general theory of relativity. But there's no math requirement for understanding Biology (though it's starting to become more quantitative and newer fields like Physical Biology are growing rapidly). A little knowledge of concepts from Chemistry is helpful, but again very little of the discussion in this book is quantitative so there's generally nothing to calculate, no equations to solve, etc. Cell Biology is much closer to something like computer programming in terms of the mental aptitude needed to understand it. To get started I recommend reading chapter 1 thoroughly, then read chapter 2 but if your eyes start to glaze over then just skip the rest of chapter 2 for now (the chemistry, while obviously fundamental and critically important is not necessary to understand deeply in order to understand the rest of the book, just as you don't really need to understand voltages and transistors in order to learn to program a computer), and then read Chapter 3 thoroughly which is all about how proteins perform most of the work in the cell including acting as microprocessors, motors, pumps, etc. By that point you'll likely be hooked and you can go back and appreciate the rest of chapter 2 when you're ready for it.So how does this Sixth edition compare too the Fifth? Well, first of all it has been seven years since the previous edition, which is nearly forever in the world of Biology, so just on that basis alone the new edition is going to be a big advance. In general the fundamentals are the same, but the fine details of understanding have advanced a great deal.An ongoing problem for the authors is the incredible volume of knowledge that exists and the near infinite and subtle complexity of even the simplest cells. This means the book could easily be three times its current size, a pressure which the authors must find a way to resist if the book is to remain portable and affordable. In the fifth edition, the book exploded past its covers and the standard edition was forced to relegate the last five chapters to PDF supplements (a huge Reference Edition with over 1600 pages was available with all chapters printed, and the e-book versions include all chapters). This was not a popular decision as it meant that even after buying and lugging around a big expensive tome, you still didn't even have all the content printed.The sixth edition now includes the entire content of the book, and there's no need for a "Reference" edition. This means however that even though the printed book has gotten slightly longer, they have had to shorten the effective size by about 250 pages! This has resulted in a lot of editing and a reduction in the number of figures. In some cases this means more effective and concise content, but in other places interesting material and in-depth discussion has been eliminated. Taking as an example chapter 4, Control of Gene Expression, the current edition has 79 figures where the previous edition had 115. Also the chapter on Sexual Reproduction has been eliminated entirely (you can download the fifth edition version of this chapter as a PDF, see

the update below) though some of its material has been integrated into other parts of the book.I cannot help but wonder if the authors have really made the right decision here. Choosing to reduce the (effective) size of the book by around 15% at a time when knowledge in the field is growing so rapidly seems rather limiting. I would personally have rather seen them embrace the idea that many of their readers will be using e-books where the length has no physical effect, or even consider breaking the book into two volumes as is often done in fields like the study of medicine. But in the end this is still intended to be a textbook, and many students will likely appreciate anything that reduces the number of pages they have to read :)A lot of work has been done to clean up the design, and they have re-created many illustrations in a more consistent style. This edition uses a pleasant blue theme in comparison to the reddish-pink of the fifth edition. It has a cleaner look overall, and I think the changes in title/heading color are a definite improvement for on-screen reading. There are a few places where figures include small areas of white-on-lime-green text that I have to zoom in on to read, but generally the changes are improvements.The content in general has been brought up to date with many sections extensively updated or re-written. Interestingly, as a sign that classic quantitative methods from Physics are starting to creep further into Biology, there's an extended section in chapter 8, Mathematical Analysis of Cell Functions, which gives some mathematical (ZOMG! some math in a Biology book!) treatment to things like gene product equilibrium and gene regulation and serves as a good introduction to the field of Physical Biology, which is another interesting way of approaching the study of life (if you find this interesting then I can also recommendÂ Physical Biology of the CellÂ which I bought and have been enjoying).Anyhow, MBoC gets all the stars as being one of those magical books that takes you deep into a whole new and fascinating world, one where you'll learn how each individual cell in your body has much more in common with a modern supercomputer than it does with that soggy old frog you dissected in high-school. The practice of modern cell biology is nothing less than hacking into alien computer systems (not designed by the mind of man) looking for technology we can appropriate or adapt to cure disease, reduce world hunger, produce clean cheap energy, and otherwise improve our lives.An exciting book for exciting times.G.Update: I've now purchased a copy of the physical book as well, just because I like it so much. It's a six pound, 13 ounce tome that's two inches thick. It's hardbound, and has the same feel and quality as the Reference edition version of the fifth edition. Paper quality (thickness, brightness) are again similar to the fifth edition. It's definitely not as lap-crushing as the old Reference edition (that extra pound or so makes a big difference).The physical book does NOT come with CD media for the supplemental movies and stuff, so you need to go to the Garland Science site to find them (under the Student tab you can

search for the movie numbers from the book without needing to create an account, or you can create an account and add the book to it to make accessing things a little easier). The GS site still seems to be rolling out information on the new edition so at some point they may have a page/site dedicated to the book as they have for some other recent textbooks. They have also now added a downloadable PDF of "MBOC, Fifth Edition - Chapter 21: Sexual Reproduction: Meiosis, Germ Cells, and Fertilization" in the sixth edition downloads area. This chapter got eliminated from the sixth edition (the meiosis section in the Cell Cycle chapter was extended a bit to compensate) so this is a useful reference to have.Update 2: I just picked up the new version ofÂ Molecular Biology of the Cell 6E - The Problems BookÂ and it’s got many VERY nice improvements over its previous version. It should really be considered "part two" of the textbook. There’s a huge amount of additional knowledge in here and it’s great to just read, not just as a workbook. Go check it out.

This edition of the textbook contains numerous updates as expected. However, there is an interesting new additional feature called "What We Don’t Know" questions near the summary of every chapter. These questions provide a better glimpse of issues that are either unclear, unknown, in progress, or still being debated among researchers. These questions can be of some use to researchers who are looking for areas that may yield fruitful pioneering opportunities or these questions can be of use to graduate students for their dissertations. Sometimes one is overwhelmed with choosing topics or questions for a dissertation (its an important decision since specialization is required in graduate school) or a grant or a research paper and these questions can provide some brainstorming material. Other novel features or updates in the 6th edition include: explaining newly discovered functions for RNA molecules; a new section in Ch. 8 emphasizing the need for mathematics to unravel the massive complexities of cellular functions (e.g. the use of differential equations to shed light on the incredible amounts of chemical dynamics in cellular processes - similar to how engineers have been using these keep track of system dynamics); focusing on cell signaling with emphasis on key principles in the circuitry of signaling systems; new sections on timing, growth control, and morphogenesis of multicellular organisms; updates on stem cell biology and technologies, etc. One sample on the current flood of data on biological systems, they wrote:"Empowered by knowledge of complete genome sequences, we can list the genes, proteins, and RNA molecules in a cell, and we have methods that allow us to begin to depict the complex web of interactions between them. But how are we to turn all this information into an understanding of how cells work? Even for a single cell type belonging to a single species of organism, the current deluge of data seems overwhelming. The sort of informal reasoning on which biologists usually rely

seems totally inadequate in the face of such complexity. In fact, the difficulty is more than just a matter of information overload. Biological systems are, for example, full of feedback loops, and the behavior of even the simplest of systems with feedback is remarkably difficult to predict by intuition alone; small changes in parameters can cause radical changes in outcome. To go from a circuit diagram to a prediction of the behavior of the system, we need detailed quantitative information, and to draw deductions from that information we need mathematics and computers. Such tools for quantitative reasoning are essential, but not all-powerful. You might think that, knowing how each protein influences each other protein, and how the expression of each gene is regulated by the products of others, we should soon be able to calculate how the cell as a whole will behave, just as an astronomer can calculate the orbits of the planets, or a chemical engineer can calculate the flows through a chemical plant. But any attempt to perform this feat for anything close to an entire living cell rapidly reveals the limits of our present knowledge. The information we have, plentiful as it is, is full of gaps and uncertainties. Moreover, it is largely qualitative not quantitative. Most often, cell biologists studying the cell's control systems sum up the knowledge in simple schematic diagrams - this book is full of them - rather than in numbers, graphs, and differential equations. To progress from qualitative descriptions and intuitive reasoning to quantitative descriptions and mathematical deduction is one of the biggest challenges for contemporary cell biology. So far, the challenge has been met only for a few very simple fragments of the machinery of living cells - subsystems involving a handful of different proteins, or two or three cross-regulatory genes, where theory and experiment go closely hand in hand. We discuss some of these examples later in the book and devote the entire final section of Chapter 8 to the role of quantitation in cell biology. Knowledge and understanding bring the power to intervene - with humans, to avoid or prevent disease; with plants, to create better crops; with bacteria, to turn them to our own uses. All these biological enterprises are linked, because the genetic information of all living organisms is written in the same language." (38)Some of the best features in the book are the discussions relating to the intersection of design and nature (e.g. fields such as Medicine and Biotechnology). They implicitly show that molecular biology is leaning a bit more towards studying cells as Systems Engineering matters. A good intro to thinking in terms of systems isÂ Systems Engineering and Analysis (5th Edition) (Prentice Hall International Series in Industrial & Systems Engineering)Â and alsoÂ Design and Analysis of Biomolecular Circuits: Engineering Approaches to Systems and Synthetic Biology. Indeed, in order to have a comprehensive look at cells, it is essential to not only see what occurs in nature, but also to to see how one can reverse engineer, synthesize, control and redirect nature's course for higher benefits.The general Table of Contents for the 6th edition is at the very bottom of the review, but I

wanted to point out some of the differences compared to the 5th edition early on:5th edition, there were 25 chapters total, but the last 4 chapters were on a DVD, not the book6th edition, there are 24 chapters and everything is in one book, but one chapter was left out - can be downloaded from the Garland Science website5th edition, Ch.2 title was "Cell Chemistry and Biosynthesis"6th edition, Ch.2 title was replaced with "Cell Chemistry and Bioenergetics"5th edition, Ch.8 title was "Manipulating Proteins, DNA, and RNA"6th edition, Ch.8 title was replaced with "Analyzing Cells, Molecules, and Systems"5th edition, Ch.13 title was "Intracellular Vesicular Traffic"6th edition, Ch.13 title was replaced with "Intracellular Membrane Traffic"5th edition, Ch.15 title was "Mechanisms of Cell Communication"6th edition, Ch.15 title was replaced with "Cell Signalling"5th edition, Ch.18 title was "Apoptosis"6th edition, Ch.18 title was replaced with "Cell Death"5th edition, Ch.19 title was "Cell Junctions, Cell Adhesion, and the Extracellular Matrix"6th edition, Ch.19 title was replaced with "Cell Junctions and the Extracellular Matrix"5th edition, Ch.21-25 were: 21. Sexual Reproduction: Meiosis, Germ Cells, and Fertilization, 22. Development of Multicellular Organisms, 23. Specialized Tissues, Stem Cells,and Tissue Renewal, 24. Pathogens, Infection, and Innate Immunity, 25. The Adaptive Immune System6th edition, Ch.21-24 are : 21. Development of Multicellular Organisms, 22. Stem Cells and Tissue Renewal, 23. Pathogens and Infection, 24. The Innate and Adaptive Immune Systems...NOTE: Chapter 21: Sexual Reproduction: Meiosis, Germ Cells, and Fertilization from the 5th edition can be downloaded from the Garland Science website for the 6th edition for free since it was left out of the 6th edition.Other free downloads available form the Garland Science book website include : Ch. 20 Cancer (the whole chapter) and the detailed Table of ContentsCells are not simple things at all, rather they are ridiculously sophisticated nanomachines with self-coding and transcribing capabilities, automated control systems, self-reproductive capabilities, informational and chemical programming, they have multiple energy-source harnessing abilities, etc. Cells are nano-chemical plants that perpetually sustain living organisms 24 hours a day, 7 days a week, 365 days a year nonstop - until they die. It is no wonder that some see cells as artifacts of nanotechnology. What makes it even more mind boggling is that trillions of cells (37 trillion based on an updated estimate as of 2013) make up our own bodies and we have have 200 different cell types with numerous specializations that allow us to fight off diseases, repair our cellular machinery without disrupting the processes of living, execute multiple simultaneous development programs, repair damaged DNA from mutations, reproduce, preform emergency protocols, recover and replenish homeostasis, process and convert food into chemical energy and reserves, give ourselves momentary boosts of energy at will, etc. With all of this, there is bound to be lots of new information and insights to come in the future editions of this textbook. The

growth of research into sophisticated regulatory gene networks, Genomics, the growth of Proteomics and Epigenetics, approaches in Synthetic Biology, Genetic Engineering, Biotechnology, Medicine, etc ensure this.Two recent examples of advances that have provoked reconsideration of the power of cells and their machinery. One is the discovery that 1 gram of DNA can store 700 terabytes of data (later researchers have discovered even more capacity, 2.2 petabytes in 1 gram of DNA). It has implications for biotechnology because the whole internet can be stored in this tiny amount! Perhaps later we will be using DNA instead of flash drives or external hard drives for storage.Another example is that it has been known that the human genome was made up of 3 billion bases, but some believed that the majority of the genome was non-functional due to protein oriented biases. After all, only 1.5% of the genome codes for proteins, while ~50% of the genome is high-copy repetitive elements, 3.5% of the genome is highly conserved sequences, and about 25% of the genome makes up genes and their regulatory elements. Since at least the 1970s, some scientists had claimed that the majority of the human genome was probably not functional since only protein coding sections of the genome (which is only 1-2% of the human genome) and very little non-protein coding was seen as useful. The remaining noncoding majority which was around 95% of the genome was seen as negligible or even without much use or 'junk'. However, this is no longer tenable in light of the updated research. The international collaboration called the ENCODE project actually tested most of the genome directly via biochemical methods and in 2012 discovered that at least 80% of the human genome was doing stuff and may not be genetic noise as was often assumed. It reported that the majority of our genome has biochemical functions due to this biochemical activity, which is a superior way to see what our cells are actually doing. The previous lower estimates, which came from comparative genomics approaches that did not rely on testing the genome directly, were a good start, but certainly not the last word. The the research was done by 440 scientists from 32 laboratories worldwide with more than 1,600 experiments. As of today the project has data from 3,300 experiments supporting the original results from ENCODE.Compared the amounts of journal subscriptions one would have to have in order stay up to date with advances in cellular research, this text is a wise investment as it distills numerous advances and stable knowledge so far, in one book. The importance of this textbook as "the standard" was highlighted a short and affordable introduction that is often consulted by fellow researchers for its excellent images and detailed drawings of actual cellular processes, machinery and molecular crowding. It is calledÂ The Machinery of LifeÂ (seeing cells as nanotechnology). Another good text isÂ Bionanotechnology: Lessons from NatureÂ (cells remind me of a complex robot scientist named "Adam" that can develop biological experiments and interpret findings in its own and also

lab-on-a-chip). Both are recommended for overviews of cellular machinery and processes.For those interested in a system views of life from cells to society, please check outÂ The Systems View of Life: A Unifying Vision. The discourse on the chain of prebiotic complexity (molecules to biomonomers to macromolecules to compartments to genetic code to metabolic networks to cells) and also the downward causation triggered by cellular signalling resulting in feedback looping to and from "genes to proteins to pathways to sub-cellular mechanisms to cells to tissues to organs to organism" are worth checking out. For those interested in the impact of cellular research on evolutionary theory - shifting towards a dynamic systems view of cells and life - one can check outÂ Evolution: A View from the 21st CenturyÂ andÂ The Logic of Chance: The Nature and Origin of Biological Evolution.Table of Contents for the 6th Edition:INTRODUCTION TO THE CELL1. Cells and Genomes2. Cell Chemistry and Bioenergetics3. ProteinsBASIC GENETIC MECHANISMS4. DNA, Chromosomes, and Genomes5. DNA Replication, Repair, and Recombination6. How Cells Read the Genome: From DNA to Protein7. Control of Gene ExpressionWAYS OF WORKING WITH CELLS8. Analyzing Cells, Molecules, and Systems9. Visualizing CellsINTERNAL ORGANIZATION OF THE CELL10. Membrane Structure11. Membrane Transport of Small Molecules and the Electrical Properties of Membranes12. Intracellular Compartments and Protein Sorting13. Intracellular Membrane Traffic14. Energy Conversion: Mitochondria and Chloroplasts15. Cell Signaling16. The Cytoskeleton17. The Cell Cycle18. Cell DeathCELLS IN THEIR SOCIAL CONTEXT19. Cell Junctions and the Extracellular Matrix20. Cancer21. Development of Multicellular Organisms22. Stem Cells and Tissue Renewal23. Pathogens and Infection24. The Innate and Adaptive Immune Systems

This is not merely the best cell/molecular biology textbook, it is likely the best textbook ever produced. The style makes the subject easy to understand while still being informative; it almost reads like a novel. Each small section makes and then illustrates a specific point. This is reiterated by clear and helpful figures. It is not a book of just facts. The reader comes to understand what experiments and what evidence supports the current models. This helps students and professionals alike improve their own thinking. The book is ideal for both undergrad and grad/medical students but still very useful for professionals already established in the field. Each new edition provides appropriately updated information without 'throwing the baby out with the bathwater'.

The Neuron: Cell and Molecular Biology Histology: A Text and Atlas: With Correlated Cell and Molecular Biology Histology: A Text and Atlas, with Correlated Cell and Molecular Biology, 6th

Edition Cell and Molecular Biology (Lippincott Illustrated Reviews Series) Histology: A Text and Atlas: With Correlated Cell and Molecular Biology (Histology (Ross)) Molecular Biology of the Cell Power Laws, Scale-Free Networks and Genome Biology (Molecular Biology Intelligence Unit) Cellular and Molecular Immunology, 8e (Cellular and Molecular Immunology, Abbas) Fish Swimming (Molecular and Cell Biochemistry) Making Cell Groups Work: Navigating the Transformation to a Cell-Based Church BRS Biochemistry, Molecular Biology, and Genetics (Board Review Series) Vitamin D: Physiology, Molecular Biology, and Clinical Applications (Nutrition and Health) Forensic Microscopy for Skeletal Tissues: Methods and Protocols (Methods in Molecular Biology) ELISA: Theory and Practice (Methods in Molecular Biology) Principles of Virology: Volume 1 Molecular Biology Molecular Biology of the Gene (7th Edition) Molecular Biology of the Gene Calculations for Molecular Biology and Biotechnology, Second Edition: A Guide to Mathematics in the Laboratory Molecular Biology: Principles of Genome Function Biological Modeling and Simulation: A Survey of Practical Models, Algorithms, and Numerical Methods (Computational Molecular Biology)