

# Book Review

## The Machinery of Life

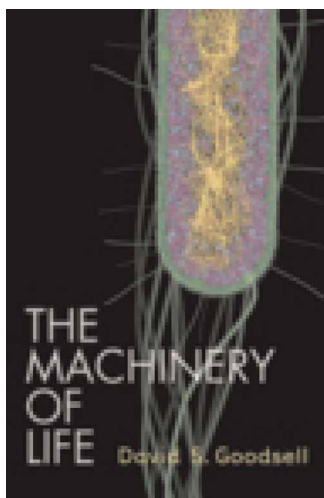
David S. Goodsell

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70 colour illustrations; Hardback; £19.99



David S. Goodsell, a renowned researcher in molecular biology, and an artist, combines his scientific interest in biological molecules with his passion for painting in this wonderful new edition of his book *The Machinery of Life*.

The book is aimed at non-scientific readers and at researchers from different disciplines who are looking for a quick and entertaining, but scientifically sound, introduction to molecular biology. But even experienced researchers across the biological sciences will derive great pleasure from dipping into the book and its charming hand-coloured pictures. *The Machinery of Life* is all about putting basic biological knowledge into perspective and developing intuition about how biological molecules assemble to build organelles, cells and whole organisms.

The book wonderfully develops the understanding of a multi-scale view on the mechanisms of life; it explains how molecules assemble to form cells and how cells work together to build whole multicellular organisms.

Without the need to understand thoroughly every single detail of each individual process and molecule, Goodsell teaches us how different molecules act in concert, and makes us appreciate and understand how processes on a molecular level are responsible for getting old, jumping when playing basketball, catching a cold or feeling hungry.

The first three chapters of the book cover a quick introduction to basic molecular biology and the biochemistry of molecules such as DNA, lipids and polysaccharides. We learn how these biological molecules are employed in cells to build new proteins or obtain energy, how they protect the cells and how cells use them to communicate with the environment.

The next two chapters describe and contrast the structure and components of *Escherichia coli* and human cells. Through these model organisms, the reader is able to appreciate the differences between prokaryotic and eukaryotic cells. Viruses are then added to this collection in Chapter 8, which is an engaging introduction to immunology and covers today's pertinent issues, such as HIV and the avian and swine flu viruses. The book explains why vaccines sometimes work and sometimes do not, and why some infections are deadly while others are easier to fight. All of this is discussed from the molecular perspective. Ultimately, it is at this level that therapeutic interventions will have to work to stop the spread of contagious diseases.

Chapters 6, 7 and 9 are what I call 'the multi-scale chapters' and these are, in my opinion, the highlights of the book. These chapters go beyond the basics, but are engrossing and easy to understand. Goodsell explains how the infrastructure within cells and communication between cells allow for complex process in our bodies, such as muscle contraction, blood flow and the firing of the nerves. By masterfully zooming in and out of the detail of basic molecular processes, Goodsell brings these basics up a level to explain cancer, ageing and death. In the last chapter, he writes about the effects that substances such as vitamins, poisons and antibiotics have on our bodies.

One of the gems of the book is the way that sizes of molecules and cells are put into perspective. For example, the size of a protein in a cell is explained as being comparable to the size of a grain of rice in a room. We can also imagine the cells in our last finger joint like rice grains filling up a whole room. Furthermore, the book develops intuition about sizes even further, since all figures are drawn on a comparable

scale; we can ‘flip between pages’ to compare the sizes of different molecules such as DNA and proteins, and structures like ribosomes, molecular pores and organelles. I must confess that, looking at empty signalling pathway diagrams in biological text books, I have never really appreciated what a crowded place cells really are!

The book is not a comprehensive manual or a textbook on molecular biology, but rather a clear, simple and magical explanation of what Goodsell finds the most fascinating about how molecules run the machinery of life. He definitely manages to convey his enthusiasm to the reader.

The strengths of the book are clear and concise language, and a short text that provides the basics, as well as develops intuition and places the basics into perspective. And, of course, the lovely pictures! The canvas size equivalents from Goodsell’s website would adorn the walls of any office — in my case, even my living room!

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