

Life's Ratchet

How Molecular Machines Extract Order from Chaos

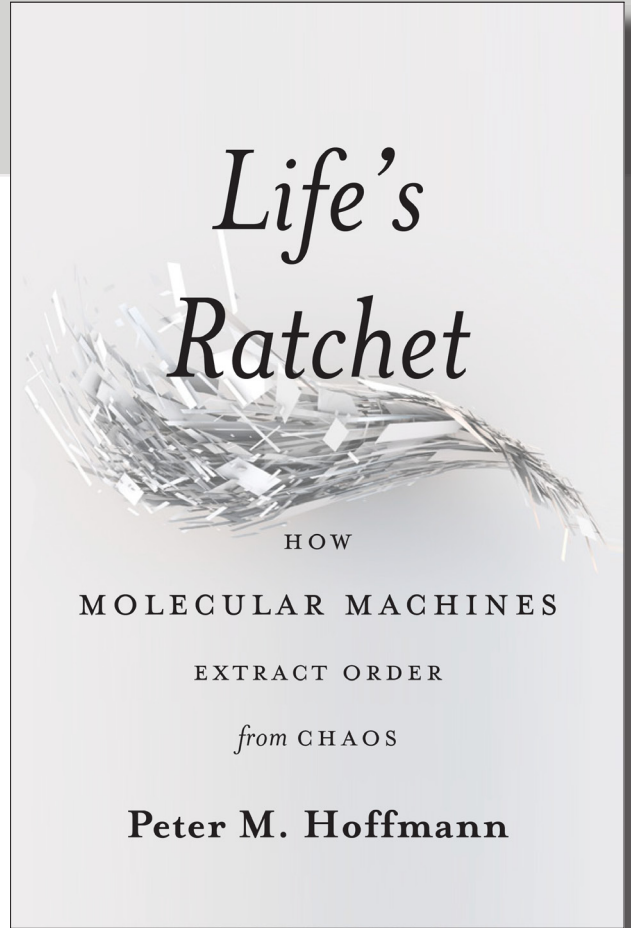
“A fascinating mix of cutting-edge science with philosophy and theology.”

—*Kirkus Reviews*, starred review

The cells in our bodies consist of molecules, made up of the same carbon, oxygen, and hydrogen atoms found in air and rocks. But molecules, such as water and sugar, are not alive. So how do our cells—assemblies of otherwise “dead” molecules—come to life, and together constitute a living being?

In **LIFE'S RATCHET: How Molecular Machines Extract Order from Chaos**, physicist Peter M. Hoffmann locates the answer to this age-old question at the nanoscale. The complex molecules of our cells can rightfully be called “molecular machines,” or “nanobots”; these machines, unlike any other, work autonomously to create order out of chaos. Tiny electrical motors turn electrical voltage into motion, tiny factories custom-build other molecular machines, and mechanical machines twist, untwist, separate and package strands of DNA. The cell is like a city—an unfathomable, complex collection of molecular worker bees working together to create something greater than themselves.

Life, Hoffmann argues, emerges from the random motions of atoms filtered through the sophisticated structures of our evolved machinery. We are essentially giant assemblies of interacting nanoscale machines; machines more amazing than can be found in any science fiction novel. Part history, part cutting-edge science, part philosophy, **LIFE'S RATCHET** takes us from ancient Greece to the laboratories of modern nanotechnology to tell the story of our quest for the machinery of life.



Peter M. Hoffmann is a Professor of Physics and Materials Science at Wayne State University in Michigan, and the Founder and Director of the university's Biomedical Physics program. The recipient of numerous awards, including the National Science Foundation Early Career Award, the Richard Barber Faculty and Staff Excellence Award, the College of Science and Presidential Teaching Awards, and the Career Development Chair Award from Wayne State University, he lives in Saint Clair Shores, Michigan.

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