

What Is Life How Chemistry Becomes Biology

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Life's Ratchet - Peter M Hoffmann
2012-10-30

Life is an enduring mystery. Yet, science tells us that living beings are merely sophisticated structures of lifeless molecules. If this view is correct, where do the seemingly

purposeful motions of cells and organisms originate? In *Life's Ratchet*, physicist Peter M. Hoffmann locates the answer to this age-old question at the nanoscale. Below the calm, ordered exterior of a living organism lies microscopic chaos, or

what Hoffmann calls the molecular storm -- specialized molecules immersed in a whirlwind of colliding water molecules. Our cells are filled with molecular machines, which, like tiny ratchets, transform random motion into ordered activity, and create the "purpose" that is the hallmark of life. Tiny electrical motors turn electrical voltage into motion, nanoscale 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 workers working together to create something greater than themselves. Life, Hoffman argues, emerges from the random motions of atoms filtered through these sophisticated structures of our

evolved machinery. We are agglomerations of interacting nanoscale machines more amazing than anything in science fiction. Rather than relying on some mysterious "life force" to drive them -- as people believed for centuries -- life's ratchets harness instead the second law of thermodynamics and the disorder of the molecular storm. Grounded in Hoffmann's own cutting-edge research, Life's Ratchet reveals the incredible findings of modern nanotechnology to tell the story of how the noisy world of atoms gives rise to life itself.

What is Life? the Physical Aspect of the Living Cell & Mind and Matter - Erwin Schrödinger 1967

The Origin of Life - Aleksandr Ivanovich Oparin 2003

This classic of biochemistry offered the first detailed exposition of the theory that living tissue was preceded upon Earth by a long and gradual evolution of nitrogen and carbon compounds. "Easily the most scholarly authority on the question...it will be a landmark for discussion for a long time to come." – New York Times.

Life on the Edge - Johnjoe McFadden
2015-07-28

New York Times bestseller • Life on the Edge alters our understanding of our world's fundamental dynamics through the use of quantum mechanics. Life is the most extraordinary phenomenon in the known universe; but how did it come to be? Even in an age of cloning and artificial biology, the remarkable truth remains: nobody has ever made anything living

entirely out of dead material. Life remains the only way to make life. Are we still missing a vital ingredient in its creation? Using first-hand experience at the cutting edge of science, Jim Al-Khalili and Johnjoe Macfadden reveal that missing ingredient to be quantum mechanics. Drawing on recent ground-breaking experiments around the world, each chapter in Life on the Edge illustrates one of life's puzzles: How do migrating birds know where to go? How do we really smell the scent of a rose? How do our genes copy themselves with such precision? Life on the Edge accessibly reveals how quantum mechanics can answer these probing questions of the universe. Guiding the reader through the rapidly unfolding discoveries of the last few years, Al-Khalili and

McFadden describe the explosive new field of quantum biology and its potentially revolutionary applications, while offering insights into the biggest puzzle of all: what is life? As they brilliantly demonstrate in these groundbreaking pages, life exists on the quantum edge. Winner, Stephen Hawking Medal for Science Communication

What is Life? - Addy Pross 2016

Seventy years ago, Erwin Schrodinger posed a simple, yet profound, question: 'What is life?'. How could the very existence of such extraordinary chemical systems be understood? This problem has puzzled biologists and physical scientists both before, and ever since. Living things are hugely complex and have unique properties, such as self-maintenance and apparently purposeful

behaviour which we do not see in inert matter. So how does chemistry give rise to biology? Did life begin with replicating molecules, and, if so, what could have led the first replicating molecules up such a path? Now, developments in the emerging field of 'systems chemistry' are unlocking the problem. Addy Pross shows how the different kind of stability that operates among replicating entities results in a tendency for certain chemical systems to become more complex and acquire the properties of life. Strikingly, he demonstrates that Darwinian evolution is the biological expression of a deeper and more fundamental chemical principle: the whole story from replicating molecules to complex life is one continuous coherent chemical process

governed by a simple definable principle. The gulf between biology and the physical sciences is finally becoming bridged.

The Vital Question - Nick Lane

2015-04-23

Why is life the way it is? Bacteria evolved into complex life just once in four billion years of life on earth-and all complex life shares many strange properties, from sex to ageing and death. If life evolved on other planets, would it be the same or completely different? In The Vital Question, Nick Lane radically reframes evolutionary history, putting forward a cogent solution to conundrums that have troubled scientists for decades. The answer, he argues, lies in energy: how all life on Earth lives off a voltage with the strength of a bolt of

lightning. In unravelling these scientific enigmas, making sense of life's quirks, Lane's explanation provides a solution to life's vital questions: why are we as we are, and why are we here at all? This is ground-breaking science in an accessible form, in the tradition of Charles Darwin's The Origin of Species, Richard Dawkins' The Selfish Gene, and Jared Diamond's Guns, Germs and Steel.

What is Life? - Paul Nurse 2021-07

What is Life? - 2014-01

Seventy years ago, Erwin Schrödinger posed a profound question: 'What is life, and how did it emerge from non-life?' Scientists have puzzled over it ever since. Addy Pross uses insights from the new field of systems chemistry to show how

chemistry can become biology, and that Darwinian evolution is the expression of a deeper physical principle.

Beyond the Molecular Frontier - National Research Council 2003-03-19
Chemistry and chemical engineering have changed significantly in the last decade. They have broadened their scope into biology, nanotechnology, materials science, computation, and advanced methods of process systems engineering and control so much that the programs in most chemistry and chemical engineering departments now barely resemble the classical notion of chemistry. *Beyond the Molecular Frontier* brings together research, discovery, and invention across the entire spectrum of the chemical sciences from fundamental,

molecular-level chemistry to large-scale chemical processing technology. This reflects the way the field has evolved, the synergy at universities between research and education in chemistry and chemical engineering, and the way chemists and chemical engineers work together in industry. The astonishing developments in science and engineering during the 20th century have made it possible to dream of new goals that might previously have been considered unthinkable. This book identifies the key opportunities and challenges for the chemical sciences, from basic research to societal needs and from terrorism defense to environmental protection, and it looks at the ways in which chemists and chemical engineers can work together to contribute to an improved future.

A New Biology for the 21st Century - National Research Council 2009-11-20
Now more than ever, biology has the potential to contribute practical solutions to many of the major challenges confronting the United States and the world. *A New Biology for the 21st Century* recommends that a "New Biology" approach—one that depends on greater integration within biology, and closer collaboration with physical, computational, and earth scientists, mathematicians and engineers—be used to find solutions to four key societal needs: sustainable food production, ecosystem restoration, optimized biofuel production, and improvement in human health. The approach calls for a coordinated effort to leverage resources across the federal, private, and academic sectors to help

meet challenges and improve the return on life science research in general.

Chemistry for the Biosciences -

Jonathan Crowe 2010-03-25

Education In Chemistry, on the first edition of *Chemistry for the Biosciences*. --

What is Life? - Addy Pross 2012-09-27

Pross examines these issues from a chemical perspective, providing a new understanding of how the sciences of chemistry and biology relate to one another.

Concepts of Biology - Samantha Fowler

2018-01-07

Concepts of Biology is designed for the single-semester introduction to biology course for non-science majors, which for many students is their only college-level science course. As such, this course

represents an important opportunity for students to develop the necessary knowledge, tools, and skills to make informed decisions as they continue with their lives. Rather than being mired down with facts and vocabulary, the typical non-science major student needs information presented in a way that is easy to read and understand. Even more importantly, the content should be meaningful. Students do much better when they understand why biology is relevant to their everyday lives. For these reasons, Concepts of Biology is grounded on an evolutionary basis and includes exciting features that highlight careers in the biological sciences and everyday applications of the concepts at hand. We also strive to show the interconnectedness of topics within this extremely broad

discipline. In order to meet the needs of today's instructors and students, we maintain the overall organization and coverage found in most syllabi for this course. A strength of Concepts of Biology is that instructors can customize the book, adapting it to the approach that works best in their classroom. Concepts of Biology also includes an innovative art program that incorporates critical thinking and clicker questions to help students understand--and apply--key concepts. *Prebiotic Chemistry* - Peter Walde 2010-02-12

D.W. Deamer, J.P. Dworkin: Chemistry and Physics of Primitive Membranes.- R.Saladino, C. Crestini, G. Costanzo, E. DiMauro: On the Prebiotic Synthesis of Nucleobases, Nucleotides, Oligonucleotides, Pre-

RNA and Pre-DNA Molecules.- R. Pascal, L. Boiteau, A. Commeyras: From the Prebiotic Synthesis of alpha-Amino Acids Towards a Primitive Translation Apparatus for the Synthesis of Peptides.- I. Weissbuch, L. Leiserowitz, M. Lahav: Stochastic "Mirror-Symmetry Breaking" via Self-Assembly, Reactivity and Amplification of Chirality: Relevance to Abiotic Conditions.- E. Szathmáry, M. Santos, C. Fernando: Evolutionary Potential and Requirements for Minimal Protocells
A New History of Life - Peter Ward
2015-04-14

An estimated 4.6 billion years ago, the Earth and Moon were formed in a violent impact. On this, many agree, and even more that a long time after that, life began. However, few know that the first life on the Earth may

not have emerged on this planet, but could, in fact, have begun on Mars, brought here by meteorites. In this revolutionary book, leading scientists Peter Ward and Joe Kirschvink rewrite the principal account of the history of life on Earth. They show not only how the rise of animals was delayed for billions of years, but also what it was that first forced fish out of the sea and onto the land. Together, the two scientists explain how developments in the environment led to multiple Ice Ages before the emergence of dinosaurs and other giant animals, and what the true cause of these great beasts' eventual extinction was. Finally, charting the course of our own evolution, they explore whether this generation will see the end of the human species. A

New History of Life proves not only that much of what we think we know should be unlearned, but also that the true history of life on Earth is much more surprising and wonderful than we could ever have imagined.

What is Life? - Erwin Schrodinger

2012-03-26

"What Is Life?" is Nobel laureate Erwin Schrödinger's exploration of the question which lies at the heart of biology. His essay, "Mind and Matter," investigates what place consciousness occupies in the evolution of life, and what part the state of development of the human mind plays in moral questions.

"Autobiographical Sketches" offers a fascinating fragmentary account of his life as a background to his scientific writings.

Molecules Of Emotion - Candace Pert

2012-12-11

Why do we feel the way we feel? How do our thoughts and emotions affect our health? Are our bodies and minds distinct from each other or do they function together as part of an interconnected system? In *MOLECULES OF EMOTION*, neuroscientist Candace Pert provides startling and decisive answers to these long-debated questions, establishing the biomolecular basis for our emotions and explaining these new scientific developments in a clear and accessible way. Her pioneering research on how the chemicals inside us form a dynamic information network, linking mind and body, is not only provocative, it is revolutionary. In her groundbreaking book, Candace Pert offers a new scientific understanding of the power

of our minds and our feelings to affect our health and well-being.

Proteins, Enzymes, Genes -

In this book a distinguished scientist-historian offers a critical account of how biochemistry and molecular biology emerged as major scientific disciplines from the interplay of chemical and biological ideas and practice. Joseph S. Fruton traces the historical development of these disciplines from antiquity to the present time, examines their institutional settings, and discusses their impact on medical, pharmaceutical, and agricultural practice.

Life Ascending - Nick Lane 2010-10-01
Winner of the 2010 Royal Society Prize for science books
Powerful new research methods are providing fresh and vivid insights into the makeup of

life. Comparing gene sequences, examining the atomic structure of proteins and looking into the geochemistry of rocks have all helped to explain creation and evolution in more detail than ever before. Nick Lane uses the full extent of this new knowledge to describe the ten greatest inventions of life, based on their historical impact, role in living organisms today and relevance to current controversies. DNA, sex, sight and consciousness are just four examples. Lane also explains how these findings have come about, and the extent to which they can be relied upon. The result is a gripping and lucid account of the ingenuity of nature, and a book which is essential reading for anyone who has ever questioned the science behind the glories of everyday life.

Regenesis - George M. Church

2014-04-08

“Bold and provocative... Regenesis tells of recent advances that may soon yield endless supplies of renewable energy, increased longevity and the return of long-extinct species.”—New Scientist In Regenesis, Harvard biologist George Church and science writer Ed Regis explore the possibilities—and perils—of the emerging field of synthetic biology. Synthetic biology, in which living organisms are selectively altered by modifying substantial portions of their genomes, allows for the creation of entirely new species of organisms. These technologies—far from the out-of-control nightmare depicted in science fiction—have the power to improve human and animal health, increase our intelligence,

enhance our memory, and even extend our life span. A breathtaking look at the potential of this world-changing technology, Regenesis is nothing less than a guide to the future of life.

Chemistry and Energy - Mark Anthony Benvenuto 2022-01-19

This book focuses on the processes and materials behind energy technologies. The author details the underlying chemistry of renewable sources, such as biofuels and wind power, as well as the traditionally used coal and gas. Chapters on energy storage technologies and the connection between energy generation and climate change round off this uniquely concise overview of the relationship between chemistry and energy.

The Chemistry of Evolution - R.J.P Williams 2005-11-29

Conventionally, evolution has always been described in terms of species. The Chemistry of Evolution takes a novel, not to say revolutionary, approach and examines the evolution of chemicals and the use and degradation of energy, coupled to the environment, as the drive behind it. The authors address the major changes of life from bacteria to man in a systematic and unavoidable sequence, reclassifying organisms as chemotypes. Written by the authors of the bestseller The Biological Chemistry of the Elements - The Inorganic Chemistry of Life (Oxford University Press, 1991), the clarity and precision of The Chemistry of Evolution plainly demonstrate that life is totally interactive with the environment. This exciting theory makes this work an essential addition

to the academic and public library. * Provides a novel analysis of evolution in chemical terms * Stresses Systems Biology * Examines the connection between life and the environment, starting with the 'big bang' theory * Reorientates the chemistry of life by emphasising the need to analyse the functions of 20 chemical elements in all organisms
Biological Inorganic Chemistry - Robert R. Crichton 2007-12-11
The importance of metals in biology, the environment and medicine has become increasingly evident over the last twenty five years. The study of the multiple roles of metal ions in biological systems, the rapidly expanding interface between inorganic chemistry and biology constitutes the subject called Biological Inorganic Chemistry. The present text, written

by a biochemist, with a long career experience in the field (particularly iron and copper) presents an introduction to this exciting and dynamic field. The book begins with introductory chapters, which together constitute an overview of the concepts, both chemical and biological, which are required to equip the reader for the detailed analysis which follows. Pathways of metal assimilation, storage and transport, as well as metal homeostasis are dealt with next. Thereafter, individual chapters discuss the roles of sodium and potassium, magnesium, calcium, zinc, iron, copper, nickel and cobalt, manganese, and finally molybdenum, vanadium, tungsten and chromium. The final three chapters provide a tantalising view of the roles of

metals in brain function, biomineralization and a brief illustration of their importance in both medicine and the environment. Relaxed and agreeable writing style. The reader will not only find the book easy to read, the fascinating anecdotes and footnotes will give him pegs to hang important ideas on. Written by a biochemist. Will enable the reader to more readily grasp the biological and clinical relevance of the subject. Many colour illustrations. Enables easier visualization of molecular mechanisms. Written by a single author. Ensures homogeneity of style and effective cross referencing between chapters. The Chemical Biology of Phosphorus - Christopher T Walsh 2020-10-29 Alexander Todd, the 1957 Nobel laureate in chemistry is credited

with the statement: “where there is life, there is phosphorus”. Phosphorus chemical biology underlies most of life’s reactions and processes, from the covalent bonds that hold RNA and DNA together, to the making and spending 75 kg of ATP every day, required to run almost all metabolic and mechanical events in cells. Authored by a renowned biochemist, *The Chemical Biology of Phosphorus* provides an in-depth, unifying chemical approach to the logic and reactivity of inorganic phosphate and its three major derivatives (anhydrides, mono- and diesters) throughout biology to examine why life depends on phosphorus. Covering the breadth of phosphorus chemistry in biology, this book is ideal for biochemistry students, postgraduates and

researchers interested in the chemical logic of phosphate metabolites, energy generation, biopolymer accumulation and phosphoproteomics.

First Life - David Deamer 2012-09
Presents an exploration of the origin of life, including when and where life began, how cells are built, and evolution.

Poison Study - Maria V. Snyder
2020-07-13

Choose: a quick death... or slow poison... Locked deep in the palace dungeon for killing her abuser, Yelena knows she’ll never be free again. The laws in Ixia are strict, and murderers must be executed, no matter the reason. But just as she’s resigned herself to her fate, she’s offered an extraordinary reprieve. As the food taster, Yelena will eat the

best meals, have rooms in the palace – and risk assassination by anyone trying to kill the Commander of Ixia. To make matters worse, the chief of security deliberately feeds her Butterfly’s Dust, and only by appearing for her daily antidote will she delay an agonizing death from the poison. As Yelena tries to escape her new dilemma, disasters keep mounting. Rebels plot to seize Ixia and Yelena develops magical powers she can’t control. Her life is threatened again, and in order to survive, she must unravel the secrets behind the past she’s been running from. Previously published. The Chronicles of Ixia Series by Maria V Snyder Book One: Poison Study Book Two: Magic Study Book Three: Fire Study Book Four: Storm Glass Book Five: Sea Glass Book Six: Spy Glass Book Seven:

Shadow Study Book Eight: Night Study Book Nine: Dawn Study

High-School Biology Today and Tomorrow - National Research Council 1989-02-01

Biology is where many of science's most exciting and relevant advances are taking place. Yet, many students leave school without having learned basic biology principles, and few are excited enough to continue in the sciences. Why is biology education failing? How can reform be accomplished? This book presents information and expert views from curriculum developers, teachers, and others, offering suggestions about major issues in biology education: what should we teach in biology and how should it be taught? How can we measure results? How should teachers be educated and certified? What

obstacles are blocking reform?
What is Life? - Paul Nurse 2020-09-03
Life is all around us, abundant and diverse, it is extraordinary. But what does it actually mean to be alive? Nobel prize-winner Paul Nurse has spent his career revealing how living cells work. In this book, he takes up the challenge of defining life in a way that every reader can understand. It is a shared journey of discovery; step by step he illuminates five great ideas that underpin biology. He traces the roots of his own curiosity and knowledge to reveal how science works, both now and in the past. Using his personal experiences, in and out of the lab, he shares with us the challenges, the lucky breaks, and the thrilling eureka moments of discovery. To survive the challenges that face the

human race today - from climate change, to pandemics, loss of biodiversity and food security - it is vital that we all understand what life is.

Childhood Disrupted - Donna Jackson Nakazawa 2016-07-26

An examination of the link between Adverse Childhood Events (ACE's) and adult illnesses.

Physical Chemistry for the Life Sciences - Peter Atkins 2011

Peter Atkins and Julio de Paula offer a fully integrated approach to the study of physical chemistry and biology.

Water in Biological and Chemical Processes - Biman Bagchi 2013-11-14

A unified overview of the dynamical properties of water and its unique and diverse role in biological and chemical processes.

Life at the Speed of Light - J. Craig Venter 2013-10-17

“Venter instills awe for biology as it is, and as it might become in our hands.” –Publishers Weekly On May 20, 2010, headlines around the world announced one of the most extraordinary accomplishments in modern science: the creation of the world’s first synthetic lifeform. In *Life at the Speed of Light*, scientist J. Craig Venter, best known for sequencing the human genome, shares the dramatic account of how he led a team of researchers in this pioneering effort in synthetic genomics—and how that work will have a profound impact on our existence in the years to come. This is a fascinating and authoritative study that provides readers an opportunity to ponder afresh the age-old question

“What is life?” at the dawn of a new era of biological engineering.

The Song of the Cell - Siddhartha Mukherjee 2022-11-03

A NEW YORK TIMES, DAILY TELEGRAPH, ECONOMIST, MAIL ON SUNDAY and GUARDIAN BOOK OF THE YEAR From the dawn of life itself, every being that has ever lived owes its existence to the cell. 'Will leave you in awe' Guardian The discovery of this vital form led to a transformation in medicine but also in our understanding of ourselves - not as bodies or machines but as ecosystems. It has also given us the power to treat a vast array of mortal maladies...and even to create new kinds of human altogether. Rich with stories of scientists, doctors and the patients whose lives may be saved by their work, *The Song of the Cell*

is a stunning ode to the building blocks of life and the cutting-edge science harnessing their power for the better. 'Profound...As big a topic as life itself' The Times
'Medical magic' Daily Telegraph
'Vast...important...optimistic' Mail on Sunday

Life's Edge - Carl Zimmer 2021-03-09

FINALIST FOR THE PEN/E.O. WILSON LITERARY SCIENCE WRITING AWARD***A
NEW YORK TIMES NOTABLE BOOK OF 2021***A
SCIENCE NEWS FAVORITE BOOK OF 2021***A
SMITHSONIAN TOP TEN SCIENCE BOOK OF 2021
"Stories that both dazzle and edify... This book is not just about life, but about discovery itself." –Siddhartha Mukherjee, New York Times Book Review
We all assume we know what life is, but the more scientists learn about the living world—from protocells to

brains, from zygotes to pandemic viruses—the harder they find it is to locate life's edge. Carl Zimmer investigates one of the biggest questions of all: What is life? The answer seems obvious until you try to seriously answer it. Is the apple sitting on your kitchen counter alive, or is only the apple tree it came from deserving of the word? If we can't answer that question here on earth, how will we know when and if we discover alien life on other worlds? The question hangs over some of society's most charged conflicts—whether a fertilized egg is a living person, for example, and when we ought to declare a person legally dead. Life's Edge is an utterly fascinating investigation that no one but one of the most celebrated science writers of our

generation could craft. Zimmer journeys through the strange experiments that have attempted to re-create life. Literally hundreds of definitions of what that should look like now exist, but none has yet emerged as an obvious winner. Lists of what living things have in common do not add up to a theory of life. It's never clear why some items on the list are essential and others not. Coronaviruses have altered the course of history, and yet many scientists maintain they are not alive. Chemists are creating droplets that can swarm, sense their environment, and multiply. Have they made life in the lab? Whether he is handling pythons in Alabama or searching for hibernating bats in the Adirondacks, Zimmer revels in astounding examples of life at its

most bizarre. He tries his own hand at evolving life in a test tube with unnerving results. Charting the obsession with Dr. Frankenstein's monster and how the world briefly believed radium was the source of all life, Zimmer leads us all the way into the labs and minds of researchers engineering life from scratch.

The Chemistry Between Us - Larry Young PhD 2012-09-13

How much control do we have over love? Much less than we like to think. All that mystery, all that poetry, all those complex behaviors surrounding human bonding leading to the most life-changing decisions we'll ever make, are unconsciously driven by a few molecules in our brains. How does love begin? How can two strangers come to the conclusion

that it would not only be pleasant to share their lives, but that they must share them? How can a man say he loves his wife, yet still cheat on her? Why do others stay in relationships even after the romance fades? How is it possible to fall in love with the “wrong” person? How do people come to have a “type”? Physical attraction, jealousy, infidelity, mother-infant bonding—all the behaviors that so often leave us befuddled—are now being teased out of the fog of mystery thanks to today’s social neuroscience. Larry Young, one of the world’s leading experts in the field, and journalist Brian Alexander explain how those findings apply to you. Drawing on real human stories and research from labs around the world, *The Chemistry Between Us* is a bold attempt to create a “grand

unified theory” of love. Some of the mind-blowing insights include: Love can get such a grip on us because it is, literally, an addiction. To a woman falling in love, a man is like her baby. Why it’s false to say society makes gender, and how it’s possible to have the body of one gender and the brain of another. Why some people are more likely to cheat than others. Why we sometimes truly can’t resist temptation. Young and Alexander place their revelations into historical, political, and social contexts. In the process, they touch on everything from gay marriage to why single-mother households might not be good for society. *The Chemistry Between Us* offers powerful insights into love, sex, gender, sexual orientation, and family life that will prove to be enlightening,

controversial, and thought provoking.

Oxygen - Nick Lane 2002

Oxygen offers fresh perspectives on our own lives and deaths, explaining modern killer diseases, why we age, and what we can do about it.

Advancing revelatory new ideas, following chains of evidence, the book ranges through many disciplines, from environmental sciences to molecular medicine. Damage to DNA caused by oxidative stress appears to explain aging and many of its diseases, hence the popularity in alternative health circles of antioxidants. But antioxidants alone fail to prevent aging. Lane suggests two different avenues of study: modulation of the immune system, which generates free radicals as part of its defense against infectious diseases; and ways of improving the

health of our cellular mitochondria, on which many age-related ailments seem to depend. Provocative and complexly argued. Copyright ©Kirkus Reviews, used with permission.

Gaia - J. E. Lovelock 2000-09-28

This classic work is reissued with a new preface by the author. Written for non-scientists the idea is put forward that life on Earth functions as a single organism.

Silent Spring - Rachel Carson 2002
Discusses the reckless annihilation of fish and birds by the use of pesticides and warns of the possible genetic effects on humans.

Molecular Biology of the Cell - Bruce Alberts 2004

Transformer - Nick Lane 2022-05-19
'One of my favourite science writers'
Bill Gates 'Hugely important' Jim Al-

Khalili For decades, biology has been dominated by information - the power of genes. Yet there is no difference in information content between a living cell and one that died a moment ago. A better question goes back to the formative years of biology: what processes animate cells and set them apart from lifeless matter? In Transformer, Nick Lane turns the standard view upside down, capturing an extraordinary scientific renaissance that is hiding in plain sight. At its core is an amazing

cycle of reactions that uses energy to transform inorganic molecules into the building blocks of life - and the reverse. To understand this cycle is to fathom the deep coherence of the living world. It connects the origin of life with the devastation of cancer, the first photosynthetic bacteria with our own mitochondria, sulphurous sludges with the emergence of consciousness, and the trivial differences between ourselves with the large-scale history of our planet.