Symbiotic Planet A New Look At Evolution By Lynn Margulis 8 Oct 1999 Paperback

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Slanted Truths

An all-inclusive catalogue of the world's living diversity, Five Kingdoms defines and describes the major divisions, or phyla, of nature's five great kingdoms - bacteria, protoctists, animals, fungi, and plants - using a modern classification scheme that is consistent with both the fossil record and molecular data. Generously illustrated and remarkably easy to follow, it not only allows readers to sample the full range of life forms inhabiting our planet but to familiarize themselves with the taxonomic theories by which all organisms' origins and distinctive characteristics are traced and classified.

Population Wars

The author takes a fresh look at time, unraveling its many mysteries and looking back at cycles of time that are lost to modern humans. Reprint. 12,500 first printing.

I Contain Multitudes

Transcending the various formal concepts of life, this captivating book offers a unique overview of life's history, essences, and future. "A masterpiece of scientific writing. You will cherish "What Is Life?" because it is so rich in poetry and science in the service of profound philosophical questions".--Mitchell Thomashow, "Orion". 9 photos. 11 line illustrations.

The Earth and I

Although Charles Darwin's theory of evolution laid the foundations of modern biology, it did not tell the whole story. Most remarkably, The Origin of Species said very little about, of all things, the origins of species. Darwin and his modern successors have shown very convincingly how inherited variations are naturally selected, but they leave unanswered how variant organisms come to be in the first

place.In Symbiotic Planet, renowned scientist Lynn Margulis shows that symbiosis, which simply means members of different species living in physical contact with each other, is crucial to the origins of evolutionary novelty. Ranging from bacteria, the smallest kinds of life, to the largest—the living Earth itself—Margulis explains the symbiotic origins of many of evolution's most important innovations. The very cells we're made of started as symbiotic unions of different kinds of bacteria. Sex—and its inevitable corollary, death—arose when failed attempts at cannibalism resulted in seasonally repeated mergers of some of our tiniest ancestors. Dry land became forested only after symbioses of algae and fungi evolved into plants. Since all living things are bathed by the same waters and atmosphere, all the inhabitants of Earth belong to a symbiotic union. Gaia, the finely tuned largest ecosystem of the Earth's surface, is just symbiosis as seen from space. Along the way, Margulis describes her initiation into the world of science and the early steps in the present revolution in evolutionary biology; the importance of species classification for how we think about the living world; and the way “academic apartheid” can block scientific advancement. Written with enthusiasm and authority, this is a book that could change the way you view our living Earth.

Gaian Systems

What is Sex?

Explores the world of microorganisms by way of drawings and photographs, providing a framework for viewing life in the microcosm

The Symbiotic Planet

This collection of linked stories by internationally renowned evolutionist Lynn Margulis reveals science from the inside--its thrills, disappointments, and triumphs. A largely fictional account, it draws on her decades of experience to portray the poor judgment, exhaustion, and life-threatening dedication of real scientists--their emotional preoccupations, sexual distractions, and passions for research. The esoteric, demanding, sometimes exhilarating world of science emerges from the shadows of its passive narrative into the sunlight of the personal voice of those who attempt to wrench secrets directly from nature. All of us who struggle to balance family, professional, and social commitments with intellectual quest will be intrigued by the humanity of these tales.

Symbiosis in Cell Evolution

Scientist, inventor, and pioneering environmentalist James Lovelock brings together a richly illustrated collection of essays on earth and human science from 12 of today's leading thinkers. From stars to cells, quantum theory to capitalism, ancient fossils to Artificial Intelligence, this book delivers a holistic understanding of our planet and

Microcosmos

Symbiogenesis

In this luminous memoir, an MIT astrophysicist must reinvent herself in the wake of tragedy and discovers the power of connection on this planet, even as she searches our galaxy for another Earth. Sara Seager has always been in love with the stars: so many lights in the sky, so much possibility. Now a pioneering planetary scientist, she searches for exoplanets—especially that distant, elusive world that sustains life. But with the unexpected death of Seager's husband, the purpose of her own life becomes hard for her to see. Suddenly, at forty, she is a widow and the single mother of two young boys. For the first time, she feels alone in the universe. As she struggles to navigate her life after loss, Seager takes solace in the alien beauty of exoplanets and the technical challenges of exploration. At the same time, she discovers earthbound connections that feel every bit as wondrous, when strangers and loved ones alike reach out to her across the space of her grief. Among them are the Widows of Concord, a group of women offering advice on everything from home maintenance to dating, and her beloved sons, Max and Alex. Most unexpected of all, there is another kind of one-in-a-billion match, not in the stars but here at home. Probing and invigoratingly honest, The Smallest Lights in the Universe is its own kind of light in the dark.

The Untrue Story of You

Scientists elucidate the astounding collective sensory capacity of Earth and its evolution through time.

Garden of Microbial Delights

Microbiology has undergone radical changes over the past few decades, ushering in an exciting new era in science. In The New Microbiology, Pascale Cossart tells a splendid story about the revolution in microbiology, especially in bacteriology. This story has wide-ranging implications for human health and medicine, agriculture, environmental science, and our understanding of evolution. The revolution results from the powerful tools of molecular and cellular biology, genomics, and bioinformatics, which have yielded amazing discoveries, from entire genome sequences to video of bacteria invading host cells. This book is for both scientists and especially nonscientists who would like to learn more about the extraordinary world of bacteria. Dr. Cossart's overview of the field of microbiology research, from infectious disease history to the ongoing scientific revolution resulting from CRISPR technologies, is presented in four parts. New concepts in microbiology introduces the world of bacteria and some recent discoveries about how they live, such as the role of regulatory RNAs including riboswitches, the CRISPR defense system, and resistance to antibiotics. Sociomicrobiology: the social lives of bacteria helps us see the new paradigm by which scientists view bacteria as highly social creatures that communicate in many ways, for example in the assemblies that reside in our intestine or in the environment. The biology of infections reviews some of history's worst epidemics and describes current and emerging infectious diseases, the organisms that cause them, and how they produce an infection. Bacteria as tools introduces us to molecules derived from microbes that scientists have harnessed in

the service of research and medicine, including the CRISPR/Cas9 genome-editing technology. The New Microbiology takes us on a journey through a remarkable revolution in science that is occurring here and now.

Five Kingdoms

Now in his 95th year, James Lovelock has been hailed as “the man who conceived the first wholly new way of looking at life on earth since Charles Darwin†? (Independent) and “the most profound scientific thinker of our time†? (Literary Review). Â A Rough Ride to the Future introduces two new Lovelockian ideas. The first is that three hundred years ago, when Thomas Newcomen invented the steam engine, he was unknowingly beginning what Lovelock calls “accelerated evolution,†? a process that is bringing about change on our planet roughly a million times faster than Darwinian evolution. The second is that as part of this process, humanity has the capacity to become the intelligent part of Gaia, the self-regulating earth system whose discovery Lovelock first announced nearly fifty years ago. Â A Rough Ride to the Future is also an intellectual autobiography, in which Lovelock reflects on his life as a lone scientist, and asks—eloquently—whether his career trajectory is possible in an age of increased bureaucratization. Â We are now changing the atmosphere again, and Lovelock argues that there is little that can be done about this. But instead of feeling guilty, we should recognize what is happening, prepare for change, and ensure that we survive as a species so we can contribute to—perhaps even guide—the next evolution of Gaia. The road will be rough, but if we are smart enough, life will continue on earth in some form far into the future.

Planets and Their Atmospheres: Origin and Evolution

This book constitutes the refereed proceedings of the 9th European Conference on Artificial Life, ECAL 2007, held in Lisbon, Portugal. The 125 revised full papers cover morphogenesis and development, robotics and autonomous agents, evolutionary computation and theory, cellular automata, models of biological systems and their applications, ant colony and swarm systems, evolution of communication, simulation of social interactions, self-replication, artificial chemistry.

Chimeras and Consciousness

A groundbreaking look at Gaia theory’s intersections with neocybernetic systems theory Often seen as an outlier in science, Gaia has run a long and varied course since its formulation in the 1970s by atmospheric chemist James Lovelock and microbiologist Lynn Margulis. Gaian Systems is a pioneering exploration of the dynamic and complex evolution of Gaia’s many variants, with special attention to Margulis’s foundational role in these developments. Bruce Clarke assesses the different dialects of systems theory brought to bear on Gaia discourse. Focusing in particular on Margulis’s work—including multiple pieces of her unpublished Gaia correspondence—he shows how her research and that of Lovelock was concurrent and conceptually parallel with the new discourse of self-referential systems that emerged within neocybernetic systems theory. The recent Gaia writings of Donna

Haraway, Isabelle Stengers, and Bruno Latour contest its cybernetic status. Clarke engages Latour on the issue of Gaia's systems description and extends his own systems-theoretical synthesis under what he terms "metabiotic Gaia." This study illuminates current issues in neighboring theoretical conversations—from biopolitics and the immunitary paradigm to NASA astrobiology and the Anthropocene. Along the way, he points to science fiction as a vehicle of Gaian thought. Delving into many issues not previously treated in accounts of Gaia, Gaian Systems describes the history of a theory that has the potential to help us survive an environmental crisis of our own making.

Symbiotic Planet

Collects illustrations and maps that visualize the vast expanse of the universe, chronicling three thousand years of human observation of the universe.

Environmental Evolution

"Sarah Stewart Johnson interweaves her own coming-of-age story as a planetary scientist with a vivid history of the exploration of Mars in this celebration of human curiosity, passion, and perseverance."—Alan Lightman, author of Einstein's Dreams NAMED ONE OF THE BEST BOOKS OF THE YEAR BY The New York Times Book Review • Times (UK) • Library Journal "Lovely . . . Johnson's prose swirls with lyrical wonder, as varied and multihued as the apricot deserts, butterscotch skies and blue sunsets of Mars."—Anthony Doerr, The New York Times Book Review Mars was once similar to Earth, but today there are no rivers, no lakes, no oceans. Coated in red dust, the terrain is bewilderingly empty. And yet multiple spacecraft are circling Mars, sweeping over Terra Sabaea, Syrtis Major, the dunes of Elysium, and Mare Sirenum—on the brink, perhaps, of a staggering find, one that would inspire humankind as much as any discovery in the history of modern science. In this beautifully observed, deeply personal book, Georgetown scientist Sarah Stewart Johnson tells the story of how she and other researchers have scoured Mars for signs of life, transforming the planet from a distant point of light into a world of its own. Johnson's fascination with Mars began as a child in Kentucky, turning over rocks with her father and looking at planets in the night sky. She now conducts fieldwork in some of Earth's most hostile environments, such as the Dry Valleys of Antarctica and the salt flats of Western Australia, developing methods for detecting life on other worlds. Here, with poetic precision, she interlaces her own personal journey—as a female scientist and a mother—with tales of other seekers, from Percival Lowell, who was convinced that a utopian society existed on Mars, to Audouin Dollfus, who tried to carry out astronomical observations from a stratospheric balloon. In the process, she shows how the story of Mars is also a story about Earth: This other world has been our mirror, our foil, a telltale reflection of our own anxieties and yearnings. Empathetic and evocative, The Sirens of Mars offers an unlikely natural history of a place where no human has ever set foot, while providing a vivid portrait of our quest to defy our isolation in the cosmos.

Cosmic Apprentice

A distinguished microbiologist explains the importance of symbiosis - where

different organisms contribute to each other's support - and how this is changing our view of life on Earth Lynn Margulis is an ardent supporter of the Gaia hypothesis: the idea that due to the finely balanced interdependence of all life forms, the planet functions as a single, giant cell. She argues that no organism is an island, and that all are linked to each other. Written with tremendous zest and authority The Symbiotic Planet traces the evolution of Earth from the origins of life and sex to the emergence of 'hyperseas' and an eerie future she describes for humanity.

A Rough Ride to the Future

The monograph examines the evolution of microorganisms and the importance of symbiosis as a mechanism of evolution. Initial chapters discuss serial endosymbiosis theory, diversity, and cell evolution in perspective. The period from prebiotic times through the development of symbiosis is examined in chapters about the Earth before cells, evolution before oxygen, atmospheric oxygen from photosynthesis, and symbiogenesis. Symbiotic evolution is examined in chapters about nuclei, mitosis, and undulipodia; undulipodia from spirochetes; mitochondria; and plastids. The work is summarized with a look at consequences of these theories in the Phanerozoic era.

Dazzle Gradually

At the crossroads of philosophy and science, the sometimes-dry topics of evolution and ecology come alive in this new collection of essays--many never before anthologized. Learn how technology may be a sort of second nature, how the systemic human fungus Candida albicans can lead to cravings for carrot cake and beer, how the presence of life may be why there's water on Earth, and many other fascinating facts. The essay "Metametazoa" presents perspectives on biology in a philosophical context, demonstrating how the intellectual librarian, pornographer, and political agitator Georges Bataille was influenced by Russian mineralogist Vladimir Vernadsky and how this led to his notion of the absence of meaning in the face of the sun--which later influenced Jacques Derrida, thereby establishing a causal chain of influence from the hard sciences to topics as abstract as deconstruction and post-modernism. In "Spirochetes Awake" the bizarre connection between syphilis and genius in the life of Friedrich Nietzsche is traced. The astonishing similarities of the Acquired-Immune-Deficiency-Syndrome symptoms with those of chronic spirochete infection, it is argued, contrast sharply with the lack of evidence that "HIV is the cause of AIDS". Throughout these readings we are dazzled by the intimacy and necessity of relationships between us and our other planetmates. In our ignorance as "civilized" people we dismiss, disdain, and deny our kinship with the only productive life forms that sustain this living planet.

Advances in Artificial Life

A fascinating and detailed examination of the evolution--and occasional devolution--of sexuality in microorganisms and more complex forms of life. Margulis and Sagan trace sex from its inauspicious beginnings in bacteria

threatened by ultraviolet radiation to its intimate relation with the origin of mitotic division of nucleated cells. The origin of meiotic sex through cannibalism followed by centriole reproductive tardiness and the connection of cell symbiosis to sex and differentiation are explored. "The authors have not only given us a new and exiting scenario for the evolution of sex, but have also provided us with critical ways in which we can test their hypotheses. . . . This is a stimulating book that is sure to invoke criticism and discussion; I strongly recommend it."--Symbiosis "The book is well organized and well written, leading the reader from one thought to another almost effortlessly. Background information is presented to aid those of us who are not experts in this field, and a glossary is appended. The book could be used at all levels of study, from interested undergraduates in general biology though postdoctoral students of genetics and evolution. I recommend this thought-provoking book to you for both your enjoyment and your enlightenment."--Richard W. Cheney, Jr., Journal of College Science Teaching "This book, undoubtedly controversial, is a thoughtful and original contribution to an important aspect of cellular biology."--John Langridge

Mycorrhizal Planet

In the pursuit of knowledge, Dorion Sagan argues in this dazzlingly eclectic, rigorously crafted, and deliciously witty collection of essays, scientific authoritarianism and philosophical obscurantism are equally formidable obstacles to discovery. As science has become more specialized and more costly, its questing spirit has been constrained by dogma. And philosophy, perhaps the discipline best placed to question orthodoxy, has retreated behind dense theoretical language and arcane topics of learning. Guided by a capacious, democratic view of science inspired by the examples set by his late parents—Carl Sagan, who popularized the study of the cosmos, and Lynn Margulis, an evolutionary biologist who repeatedly clashed with the scientific establishment—Sagan draws on classical and contemporary philosophy to intervene provocatively in often-charged debates on thermodynamics, linear and nonlinear time, purpose, ethics, the links between language and psychedelic drugs, the search for extraterrestrial intelligence, and the occupation of the human body by microbial others. Informed by a countercultural sensibility, a deep engagement with speculative thought, and a hardheaded scientific skepticism, he advances controversial positions on such seemingly sacrosanct subjects as evolution and entropy. At the same time, he creatively considers a wide range of thinkers, from Socrates to Bataille and Descartes to von Uexküll, to reflect on sex, biopolitics, and the free will of Kermit the Frog. Refreshingly nonconformist and polemically incisive, Cosmic Apprentice challenges readers to reject both dogma and cliché and instead recover the intellectual spirit of adventure that should—and can once again—animate both science and philosophy.

Symbiotic Planet

Tireless, controversial, and hugely inspirational to those who knew her or encountered her work, Lynn Margulis was a scientist whose intellectual energy and interests knew no bounds. Best known for her work on the origins of eukaryotic cells, the Gaia hypothesis, and symbiogenesis as a driving force in evolution, her work has forever changed the way we understand life on Earth. When Margulis

passed away in 2011, she left behind a groundbreaking scientific legacy that spanned decades. In this collection, Dorion Sagan, Margulis's son and longtime collaborator, gathers together the voices of friends and colleagues to remark on her life and legacy, in essays that cover her early collaboration with James Lovelock, her fearless face-off with Richard Dawkins during the so-called "Battle of Balliol" at Oxford, the intrepid application of her scientific mind to the insistence that 9/11 was a false-flag operation, her affinity for Emily Dickinson, and more. Margulis was elected to the National Academy of Sciences in 1983, received the prestigious National Medal of Science in 1999, and her papers are permanently archived at the Library of Congress. Less than a month before her untimely death, Margulis was named one of the twenty most influential scientists alive - one of only two women on this list, which include such scientists as Stephen Hawking, James Watson, and Jane Goodall.

Origins of Sex

How do new species evolve? Although Darwin identified inherited variation as the creative force in evolution, he never formally speculated where it comes from. His successors thought that new species arise from the gradual accumulation of random mutations of DNA. But despite its acceptance in every major textbook, there is no documented instance of it. Lynn Margulis and Dorion Sagan take a radically new approach to this question. They show that speciation events are not, in fact, rare or hard to observe. Genomes are acquired by infection, by feeding, and by other ecological associations, and then inherited. Acquiring Genomes is the first work to integrate and analyze the overwhelming mass of evidence for the role of bacterial and other symbioses in the creation of plant and animal diversity. It provides the most powerful explanation of speciation yet given.

The Microcosmos Coloring Book

In The Untrue Story of You, Bryan Hubbard presents a powerful, groundbreaking theory explaining who we really are, how our relationship to our past affects us and how we can finally find true healing. In the pages of this book, you will discover that 'you' are actually made up of Three Selves, or time-bodies – past, present and potential - and that these three distinct entities send out energetic pulses, or waves, that interact to create your experience of life. As you move through life, experiences you never fully understood from your past begin to weigh you down, causing you to respond in the present with anxiety and fear without knowing why. As this pattern repeats itself, it can drag you into depression or addictive behaviours that are seemingly out of your control. Sharing his own moving story of overcoming the painful experiences of his childhood, Bryan teaches you how to heal the negative patterns you have created in your life, and, through a 21-day programme, become the real 'you' – the child you once were who could see the world as it really is, an unfolding miracle in the present moment.

A Sideways Look at Time

A new perspective on the biological roots of competition from the author of Anarchy Evolution and Cornell lecturer

Luminous Fish

Planets and Their Atmospheres: Origin and Evolution

Acquiring Genomes

Chronicles the evolution of life on Earth, focusing on the microcosm researchers believe life began with.

The New Microbiology

From one of the world's leading natural scientists and the acclaimed author of Trilobite!, Life: A Natural History of Four Billion Years of Life on Earth and Dry Storeroom No. 1 comes a fascinating chronicle of life's history told not through the fossil record but through the stories of organisms that have survived, almost unchanged, throughout time. Evolution, it seems, has not completely obliterated its tracks as more advanced organisms have evolved; the history of life on earth is far older—and odder—than many of us realize. Scattered across the globe, these remarkable plants and animals continue to mark seminal events in geological time. From a moonlit beach in Delaware, where the hardy horseshoe crab shuffles its way to a frenzy of mass mating just as it did 450 million years ago, to the dense rainforests of New Zealand, where the elusive, unprepossessing velvet worm has burrowed deep into rotting timber since before the breakup of the ancient supercontinent, to a stretch of Australian coastline with stromatolite formations that bear witness to the Precambrian dawn, the existence of these survivors offers us a tantalizing glimpse of pivotal points in evolutionary history. These are not "living fossils" but rather a handful of tenacious creatures of days long gone. Written in buoyant, sparkling prose, Horseshoe Crabs and Velvet Worms is a marvelously captivating exploration of the world's old-timers combining the very best of science writing with an explorer's sense of adventure and wonder.

Symbiosis in Cell Evolution

Exploring the broad implications of evolutionary theorist Lynn Margulis's work, this collection brings together specialists across a range of disciplines, from paleontology, molecular biology, evolutionary theory, and geobiology to developmental systems theory, archaeology, history of science, cultural science studies, and literature and science. Addressing the multiple themes that animated Margulis's science, the essays within take up, variously, astrobiology and the origin of life, ecology and symbiosis from the microbial to the planetary scale, the coupled interactions of earthly environments and evolving life in Gaia theory and earth system science, and the connections of these newer scientific ideas to cultural and creative productions. Dorion Sagan acquaints the reader with salient issues in Lynn Margulis's scientific work, the controversies they raised, and the vocabulary necessary to follow the arguments. Sankar Chatterjee synthesizes several strands of current theory for the origin of life on earth. James Strick tells the intertwined origin stories of James Lovelock's Gaia hypothesis and Margulis's serial endosymbiosis theory. Jan Sapp explores the distinct phylogenetic visions of Margulis and Carl Woese. Susan Squier examines the epigenetics of embryologist

and developmental biologist C. H. Waddington. Bruce Clarke studies the convergence of ecosystem ecology, systems theory, and science fiction between the 1960s and the 1980s. James Shapiro discusses the genome evolution that results not from random changes but rather from active cell processes. Susan Oyama shows how the concept of development balances an over-emphasis on genetic coding and other deterministic schemas. Christopher Witmore studies the ways in which a concentrated animal feeding operation, or CAFO, mixes up natural resources, animal lives, and human appetites. And Peter Westbroek brings the insights of earth system science toward a new worldview essential for a proper response to global change.

Earth, Life, and System

A look at the sexual impulse that is at the root of our very biological existence includes scientific discussions on the origins of gender, sexual strategies of life forms from mitochondria to humans, and the language of sexuality. 15,000 first printing.

Horseshoe Crabs and Velvet Worms

Although Charles Darwin's theory of evolution laid the foundations of modern biology, it did not tell the whole story. Most remarkably, The Origin of Species said very little about, of all things, the origins of species. Darwin and his modern successors have shown very convincingly how inherited variations are naturally selected, but they leave unanswered how variant organisms come to be in the first place. In Symbiotic Planet, renowned scientist Lynn Margulis shows that symbiosis, which simply means members of different species living in physical contact with each other, is crucial to the origins of evolutionary novelty. Ranging from bacteria, the smallest kinds of life, to the largest -- the living Earth itself -- Margulis explains the symbiotic origins of many of evolution's most important innovations. The very cells we're made of started as symbiotic unions of different kinds of bacteria. Sex -- and its inevitable corollary, death -- arose when failed attempts at cannibalism resulted in seasonally repeated mergers of some of our tiniest ancestors. Dry land became forested only after symbioses of algae and fungi evolved into plants. Since all living things are bathed by the same waters and atmosphere, all the inhabitants of Earth belong to a symbiotic union. Gaia, the finely tuned largest ecosystem of the Earth's surface, is just symbiosis as seen from space. Along the way, Margulis describes her initiation into the world of science and the early steps in the present revolution in evolutionary biology; the importance of species classification for how we think about the living world; and the way "academic apartheid" can block scientific advancement. Written with enthusiasm and authority, this is a book that could change the way you view our living Earth.

Lynn Margulis

In Mycorrhizal Planet, Michael Phillips offers new insights into the invisible world beneath our feet, explaining the crucial, symbiotic role that fungi play in everything from healthy plants to healthy soils to a healthy planet.--COVER.

Mystery Dance

Fifteen distinguished scientists discuss the effects of life—past and present—on planet Earth.

Cosmigraphics

"Lynn Margulis is one of the most successful synthetic thinkers in modern biology. This collection of her work, enhanced by essays co-authored with Dorion Sagan, is a welcome introduction to the full breadth of her many contributions." EDWARD O. WILSON, AUTHOR OF THE DIVERSITY OF LIFE "An important contribution to the history of the 20th century. Read it and you will taste the flavor of real science." JAMES LOVELOCK, AUTHOR OF GAIA: A NEW LOOK AT LIFE ON EARTH "Truly inspirational and of fundamental importance. This thoughtful series of essays on some of the largest questions concerning the nature of life on earth deserves careful study."PETER RAVEN, MISSOURI BOTANICAL GARDEN

Origin of Eukaryotic Cells

Joining the ranks of popular science classics like The Botany of Desire and The Selfish Gene, a groundbreaking, wondrously informative, and vastly entertaining examination of the most significant revolution in biology since Darwin—a “microbe’s-eye view” of the world that reveals a marvelous, radically reconceived picture of life on earth. Every animal, whether human, squid, or wasp, is home to millions of bacteria and other microbes. Ed Yong, whose humor is as evident as his erudition, prompts us to look at ourselves and our animal companions in a new light—less as individuals and more as the interconnected, interdependent multitudes we assuredly are. The microbes in our bodies are part of our immune systems and protect us from disease. In the deep oceans, mysterious creatures without mouths or guts depend on microbes for all their energy. Bacteria provide squid with invisibility cloaks, help beetles to bring down forests, and allow worms to cause diseases that afflict millions of people. Many people think of microbes as germs to be eradicated, but those that live with us—the microbiome—build our bodies, protect our health, shape our identities, and grant us incredible abilities. In this astonishing book, Ed Yong takes us on a grand tour through our microbial partners, and introduces us to the scientists on the front lines of discovery. It will change both our view of nature and our sense of where we belong in it.

The Sirens of Mars

Explores the complex factors and long line of "ancestors" that have contributed to human sexuality and human sexual behavior

What Is Life?

This is the story of a profound revolution in the way biologists explore life's history, understand its evolutionary processes, and reveal its diversity. It is about life's smallest entities, deepest diversity, and greatest cellular biomass: the microbiosphere. Jan Sapp introduces us to a new field of evolutionary biology and a

new brand of molecular evolutionists who descend to the foundations of evolution on Earth to explore the origins of the genetic system and the primary life forms from which all others have emerged. In so doing, he examines-from Lamarck to the present-the means of pursuing the evolution of complexity, and of depicting the greatest differences among organisms. The New Foundations of Evolution takes us into a world that classical evolutionists could never have imagined: a deep phylogeny based on three domains of life and multiple kingdoms, and created by mechanisms very unlike those considered by Darwin and his followers. Evolution by leaps seems to occur regularly in the microbial world where molecular evolutionists have shown the inheritance of acquired genes and genomes are major modes of evolutionary innovation. Revisiting the history of microbiology for the first time from the perspective of evolutionary biology, Sapp shows why classical Darwinian conceptions centering on questions of the origin of species were forged without a microbial foundation, why classical microbiologists considered it impossible to know the course of evolution, and classical molecular biologists considered the evolution of the molecular genetic system to be beyond understanding. In telling this stirring story of scientific iconoclasm, this book elucidates how the new evolutionary biology arose, what methods and assumptions underpin it, and the fiery controversies that continue to shape biologists' understanding of the foundations of evolution today.

The New Foundations of Evolution

The Smallest Lights in the Universe

Evolution.