

## Some Assembly Required Decoding Four Billion Years Of Life From Ancient Fossils To Dna

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### The Rise and Fall of the Dinosaurs

A New York Times-bestselling author explains how the physical world shaped the history of our species. When we talk about human history, we often focus on great leaders, population forces, and decisive wars. But how has the earth itself determined our destiny? Our planet wobbles, driving changes in climate that forced the transition from nomadism to farming. Mountainous terrain led to the development of democracy in Greece. Atmospheric circulation patterns later on shaped the progression of global exploration, colonization, and trade. Even today, voting behavior in the south-east United States ultimately follows the underlying pattern of 75 million-year-old sediments from an ancient sea. Everywhere is the deep imprint of the planetary on the human. From the cultivation of the first crops to the founding of modern states, *Origins* reveals the breathtaking impact of the earth beneath our feet on the shape of our human civilizations.

### The Lady's Handbook for Her Mysterious Illness

The invasion of land by ocean-dwelling plants and animals was one of the most revolutionary events in the evolution of life on Earth, yet the animal invasion almost failed—twice—because of the twin mass extinctions of the Late Devonian Epoch. Some 359 to 375 million years ago, these catastrophic events dealt our ancestors a blow that almost drove them back into the sea. If those extinctions had been just a bit more severe, spiders and insects—instead of vertebrates—might have become the ecologically dominant forms of animal life on land. This book examines the profound evolutionary consequences of the Late Devonian extinctions and the various theories proposed to explain their occurrence. Only one group of four-limbed vertebrates exists on Earth, while other tetrapod-like fishes are extinct. This gap is why the idea of "fish with feet" seems so peculiar to us, yet such animals were once a vital part of our world, and if the Devonian extinctions had not happened, members of these species, like the famous *Acanthostega* and *Ichthyostega*, might have continued to live in our rivers and lakes. Synthesizing decades of research and including a wealth of new discoveries, this accessible, comprehensive text explores the causes of the Devonian extinctions, the reasons vertebrates were so severely affected, and the potential evolution of the modern world if the extinctions had never taken place.

### Until the End of Time

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Kareem Abdul-Jabbar, basketball legend and the NBA's alltime leading scorer, champions a lineup of little-known African-American inventors in this lively, kid-friendly book. Did you know that James West invented the microphone in your cell phone? That Fred Jones invented the refrigerated truck that makes supermarkets possible? Or that Dr. Percy Julian synthesized cortisone from soy, easing untold people's pain? These are just some of the black inventors and innovators scoring big points in this dynamic look at several unsung heroes who shared a desire to improve people's lives. Offering profiles with fast facts on flaps and framed by a funny contemporary story featuring two feisty twins, here is a nod to the minds behind the gamma electric cell and the ice-cream scoop, improvements to traffic lights, open-heart surgery, and more — inventors whose ingenuity and perseverance against great odds made our world safer, better, and brighter. Back matter includes an authors' note and sources.

### **When the Earth Had Two Moons**

An introduction to evolutionary biology spans evolutionary science from its inception to its latest findings, covering discoveries, philosophy, and history.

### **Your Inner Fish**

An earthquake shatters Haiti and a hurricane slices through Texas. We hear that nature runs rampant, seeking to destroy us through these 'natural disasters'. Science recounts a different story, however: disasters are not the consequence of natural causes; they are the consequence of human choices and decisions. we put ourselves in harm's way; we fail to take measures which we know would prevent disasters, no matter what the environment does. This can be both hard to accept, and hard to unravel. A complex of factors shape disasters. They arise from the political processes dictating where and what we build, and from social circumstances which create and perpetuate poverty and discrimination. They develop from the social preference to blame nature for the damage wrought, when in fact events such as earthquakes and storms are entirely commonplace environmental processes We feel the need to fight natural forces, to reclaim what we assume is ours, and to protect ourselves from what we perceive to be wrath from outside our communities. This attitude distracts us from the real causes of disasters: humanity's decisions, as societies and as individuals. It stops us accepting the real solutions to disasters: making better decisions. This book explores stories of some of our worst disasters to show how we can and should act to stop people dying when nature unleashes its energies. The disaster is not the tornado, the volcanic eruption, or climate change, but the deaths and injuries, the loss of irreplaceable property, and the lack and even denial of support to affected people, so that a short-term interruption becomes a long-term recovery nightmare. But we can combat this, as Kelman shows, describing inspiring examples of effective human action that limits damage, such as managing flooding in Toronto and villages in Bangladesh, or wildfire in Colorado. Throughout, his message is clear: there is no such thing as a natural disaster. The disaster lies in our inability to deal with the environment and with ourselves.

### **Symphony in C: Carbon and the Evolution of (Almost) Everything**

A major new book overturning our assumptions about how evolution works Earth's natural history is full of fascinating instances of convergence: phenomena like eyes and wings and tree-climbing lizards that have evolved independently, multiple times. But evolutionary biologists also point out many examples of contingency, cases where the tiniest change—a random

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mutation or an ancient butterfly sneeze—caused evolution to take a completely different course. What role does each force really play in the constantly changing natural world? Are the plants and animals that exist today, and we humans ourselves, inevitabilities or evolutionary flukes? And what does that say about life on other planets? Jonathan Losos reveals what the latest breakthroughs in evolutionary biology can tell us about one of the greatest ongoing debates in science. He takes us around the globe to meet the researchers who are solving the deepest mysteries of life on Earth through their work in experimental evolutionary science. Losos himself is one of the leaders in this exciting new field, and he illustrates how experiments with guppies, fruit flies, bacteria, foxes, and field mice, along with his own work with anole lizards on Caribbean islands, are rewinding the tape of life to reveal just how rapid and predictable evolution can be. *Improbable Destinies* will change the way we think and talk about evolution. Losos's insights into natural selection and evolutionary change have far-reaching applications for protecting ecosystems, securing our food supply, and fighting off harmful viruses and bacteria. This compelling narrative offers a new understanding of ourselves and our role in the natural world and the cosmos.

### **Across the Bridge**

The air we breathe is twenty-one percent oxygen, an amount higher than on any other known world. While we may take our air for granted, Earth was not always an oxygenated planet. How did it become this way? Donald Canfield—one of the world's leading authorities on geochemistry, earth history, and the early oceans—covers this vast history, emphasizing its relationship to the evolution of life and the evolving chemistry of the Earth. Canfield guides readers through the various lines of scientific evidence, considers some of the wrong turns and dead ends along the way, and highlights the scientists and researchers who have made key discoveries in the field. Showing how Earth's atmosphere developed over time, *Oxygen* takes readers on a remarkable journey through the history of the oxygenation of our planet.

### **The Shape of Life**

An astonishing exploration of planet formation and the origins of life by one of the world's most innovative planetary geologists. In 1959, the Soviet probe Luna 3 took the first photos of the far side of the moon. Even in their poor resolution, the images stunned scientists: the far side is an enormous mountainous expanse, not the vast lava-plains seen from Earth. Subsequent missions have confirmed this in much greater detail. How could this be, and what might it tell us about our own place in the universe? As it turns out, quite a lot. Fourteen billion years ago, the universe exploded into being, creating galaxies and stars. Planets formed out of the leftover dust and gas that coalesced into larger and larger bodies orbiting around each star. In a sort of heavenly survival of the fittest, planetary bodies smashed into each other until solar systems emerged. Curiously, instead of being relatively similar in terms of composition, the planets in our solar system, and the comets, asteroids, satellites and rings, are bewitchingly distinct. So, too, the halves of our moon. In *When the Earth Had Two Moons*, esteemed planetary geologist Erik Asphaug takes us on an exhilarating tour through the farthest reaches of time and our galaxy to find out why. Beautifully written and provocatively argued, *When the Earth Had Two Moons* is not only a mind-blowing astronomical tour but a profound inquiry into the nature of life here—and billions of miles from home.

### **Life on a Young Planet**

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A powerful examination of what we think we know about the brain and why -- despite technological advances -- the workings of our most essential organ remain a mystery. For thousands of years, thinkers and scientists have tried to understand what the brain does. Yet, despite the astonishing discoveries of science, we still have only the vaguest idea of how the brain works. In *The Idea of the Brain*, scientist and historian Matthew Cobb traces how our conception of the brain has evolved over the centuries. Although it might seem to be a story of ever-increasing knowledge of biology, Cobb shows how our ideas about the brain have been shaped by each era's most significant technologies. Today we might think the brain is like a supercomputer. In the past, it has been compared to a telegraph, a telephone exchange, or some kind of hydraulic system. What will we think the brain is like tomorrow, when new technology arises? The result is an essential read for anyone interested in the complex processes that drive science and the forces that have shaped our marvelous brains.

### **Some Assembly Required**

The author of the best-selling *Your Inner Fish* gives us a lively and accessible account of the great transformations in the history of life on Earth--a new view of the evolution of human and animal life that explains how the incredible diversity of life on our planet came to be. Over billions of years, ancient fish evolved to walk on land, reptiles transformed into birds that fly, and apelike primates evolved into humans that walk on two legs, talk, and write. For more than a century, paleontologists have traveled the globe to find fossils that show how such changes have happened. We have now arrived at a remarkable moment—prehistoric fossils coupled with new DNA technology have given us the tools to answer some of the basic questions of our existence: How do big changes in evolution happen? Is our presence on Earth the product of mere chance? This new science reveals a multibillion-year evolutionary history filled with twists and turns, trial and error, accident and invention. In *Some Assembly Required*, Neil Shubin takes readers on a journey of discovery spanning centuries, as explorers and scientists seek to understand the origins of life's immense diversity.

### **Evolution**

From one of our finest and most popular science writers, the best-selling author of *Your Inner Fish*, comes the answer to a scientific mystery story as big as the world itself: How have astronomical events that took place millions of years ago created the unique qualities of the human species? In his last book, Neil Shubin delved into the amazing connections between human anatomy—our hands, our jaws—and the structures in the fish that first took over land 375 million years ago. Now, with his trademark clarity and exuberance, he takes an even more expansive approach to the question of why we are the way we are. Starting once again with fossils, Shubin turns his gaze skyward. He shows how the entirety of the universe's 14-billion-year history can be seen in our bodies. From our very molecular composition (a result of stellar events at the origin of our solar system), he makes clear, through the working of our eyes, how the evolution of the cosmos has had profound effects on the development of human life on earth. From the Hardcover edition.

### **Some Assembly Required**

Rudolf Raff is recognized as a pioneer in evolutionary developmental biology. In their 1983 book, *Embryos, Genes, and Evolution*, Raff and co-author Thomas Kaufman proposed a synthesis of developmental and evolutionary biology. In *The Shape of Life*, Raff analyzes the

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rise of this new experimental discipline and lays out new research questions, hypotheses, and approaches to guide its development. Raff uses the evolution of animal body plans to exemplify the interplay between developmental mechanisms and evolutionary patterns. Animal body plans emerged half a billion years ago. Evolution within these body plans during this span of time has resulted in the tremendous diversity of living animal forms. Raff argues for an integrated approach to the study of the intertwined roles of development and evolution involving phylogenetic, comparative, and functional biology. This new synthesis will interest not only scientists working in these areas, but also paleontologists, zoologists, morphologists, molecular biologists, and geneticists.

### **Footprints**

A leading neuroscientist offers a history of the evolution of the brain from unicellular organisms to the complexity of animals and human beings today. Renowned neuroscientist Joseph LeDoux digs into the natural history of life on earth to provide a new perspective on the similarities between us and our ancestors in deep time. This page-turning survey of the whole of terrestrial evolution sheds new light on how nervous systems evolved in animals, how the brain developed, and what it means to be human. In *The Deep History of Ourselves*, LeDoux argues that the key to understanding human behavior lies in viewing evolution through the prism of the first living organisms. By tracking the chain of the evolutionary timeline he shows how even the earliest single-cell organisms had to solve the same problems we and our cells have to solve each day. Along the way, LeDoux explores our place in nature, how the evolution of nervous systems enhanced the ability of organisms to survive and thrive, and how the emergence of what we humans understand as consciousness made our greatest and most horrendous achievements as a species possible.

### **When the Invasion of Land Failed**

An engaging history of the surprising, poignant, and occasionally scandalous stories behind scientific names and their cultural significance, "More fun than you've ever had with taxonomy in your whole entire life!" (Diana Gabaldon, author of the *Outlander* series and PhD in Quantitative Behavioral Ecology) Ever since Carl Linnaeus's binomial system of scientific names was adopted in the eighteenth century, scientists have been eponymously naming organisms in ways that both honor and vilify their namesakes. This charming, informative, and accessible history examines the fascinating stories behind taxonomic nomenclature, from Linnaeus himself naming a small and unpleasant weed after a rival botanist to the recent influx of scientific names based on pop-culture icons--including David Bowie's spider, Frank Zappa's jellyfish, and Beyoncé's fly. Exploring the naming process as an opportunity for scientists to express themselves in creative ways, Stephen B. Heard's fresh approach shows how scientific names function as a window into both the passions and foibles of the scientific community and as a more general indicator of the ways in which humans relate to, and impose order on, the natural world.

### **The Idea of the Brain**

Neil Shubin, the paleontologist and professor of anatomy who co-discovered Tiktaalik, the "fish with hands," tells the story of our bodies as you've never heard it before. The basis for the PBS series. By examining fossils and DNA, he shows us that our hands actually resemble fish fins, our heads are organized like long-extinct jawless fish, and major parts of our genomes look

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and function like those of worms and bacteria. Your Inner Fish makes us look at ourselves and our world in an illuminating new light. This is science writing at its finest—enlightening, accessible and told with irresistible enthusiasm.

### **Some Assembly Required**

Part road-trip comedy and part social science experiment, a scientist and a journalist travel the globe to discover the secret behind what makes things funny, questioning countless experts, including Louis C.K., along the way.

### **The Humor Code**

No fight over what gets taught in American classrooms is more heated than the battle over humanity's origins. For more than a century we have argued about evolutionary theory and creationism (and its successor theory, intelligent design), yet we seem no closer to a resolution than we were in Darwin's day. In this thoughtful examination of how we teach origins, historian Adam Laats and philosopher Harvey Siegel offer crucial new ways to think not just about the evolution debate but how science and religion can make peace in the classroom. Laats and Siegel agree with most scientists: creationism is flawed, as science. But, they argue, students who believe it nevertheless need to be accommodated in public school science classes. Scientific or not, creationism maintains an important role in American history and culture as a point of religious dissent, a sustained form of protest that has weathered a century of broad—and often dramatic—social changes. At the same time, evolutionary theory has become a critical building block of modern knowledge. The key to accommodating both viewpoints, they show, is to disentangle belief from knowledge. A student does not need to believe in evolution in order to understand its tenets and evidence, and in this way can be fully literate in modern scientific thought and still maintain contrary religious or cultural views. Altogether, Laats and Siegel offer the kind of level-headed analysis that is crucial to finding a way out of our culture-war deadlock.

### **Disaster by Choice**

When Julia Zarankin saw her first red-winged blackbird at the age of thirty-five, she didn't expect that it would change her life. Recently divorced and auditioning hobbies during a stressful career transition, she stumbled on birdwatching, initially out of curiosity for the strange breed of humans who wear multi-pocketed vests, carry spotting scopes and discuss the finer points of optics with disturbing fervour. What she never could have predicted was that she would become one of them. Not only would she come to identify proudly as a birder, but birding would ultimately lead her to find love, uncover a new language and lay down her roots. *Field Notes from an Unintentional Birder* tells the story of finding meaning in midlife through birds. The book follows the peregrinations of a narrator who learns more from birds than she ever anticipated, as she begins to realize that she herself is a migratory species: born in the former Soviet Union, growing up in Vancouver and Toronto, studying and working in the United States and living in Paris. Coming from a Russian immigrant family of concert pianists who believed that the outdoors were for "other people," Julia Zarankin recounts the challenges and joys of unexpectedly discovering one's wild side and finding one's tribe in the unlikeliest of places. Zarankin's thoughtful and witty anecdotes illuminate the joyful experience of a new discovery and the surprising pleasure to be found while standing still on the edge of a lake at six a.m. In addition to confirmed nature enthusiasts, this book will appeal to readers of literary

memoir, offering keen insight on what it takes to find one's place in the world.

## Written in Stone (Icon Science)

With the 2006 publication of *The God Delusion*, the name Richard Dawkins became a byword for ruthless skepticism and "brilliant, impassioned, articulate, impolite" debate (*San Francisco Chronicle*). His first memoir offers a more personal view. His first book, *The Selfish Gene*, caused a seismic shift in the study of biology by proffering the gene-centered view of evolution. It was also in this book that Dawkins coined the term meme, a unit of cultural evolution, which has itself become a mainstay in contemporary culture. In *An Appetite for Wonder*, Richard Dawkins shares a rare view into his early life, his intellectual awakening at Oxford, and his path to writing *The Selfish Gene*. He paints a vivid picture of his idyllic childhood in colonial Africa, peppered with sketches of his colorful ancestors, charming parents, and the peculiarities of colonial life right after World War II. At boarding school, despite a near-religious encounter with an Elvis record, he began his career as a skeptic by refusing to kneel for prayer in chapel. Despite some inspired teaching throughout primary and secondary school, it was only when he got to Oxford that his intellectual curiosity took full flight. Arriving at Oxford in 1959, when undergraduates "left Elvis behind" for Bach or the Modern Jazz Quartet, Dawkins began to study zoology and was introduced to some of the university's legendary mentors as well as its tutorial system. It's to this unique educational system that Dawkins credits his awakening, as it invited young people to become scholars by encouraging them to pose rigorous questions and scour the library for the latest research rather than textbook "teaching to" any kind of test. His career as a fellow and lecturer at Oxford took an unexpected turn when, in 1973, a serious strike in Britain caused prolonged electricity cuts, and he was forced to pause his computer-based research. Provoked by the then widespread misunderstanding of natural selection known as "group selection" and inspired by the work of William Hamilton, Robert Trivers, and John Maynard Smith, he began to write a book he called, jokingly, "my bestseller." It was, of course, *The Selfish Gene*. Here, for the first time, is an intimate memoir of the childhood and intellectual development of the evolutionary biologist and world-famous atheist, and the story of how he came to write what is widely held to be one of the most important books of the twentieth century.

## Charles Darwin's Barnacle and David Bowie's Spider

An enchanting biography of the most resonant—and most necessary—chemical element on Earth. Carbon is everywhere: in the paper of this book and the blood of our bodies. It's with us from beginning to end, present in our baby clothes and coffin alike. We live on a carbon planet, and we are carbon life. No other element is so central to our well-being; yet, when missing or misaligned, carbon atoms can also bring about disease and even death. At once ubiquitous and mysterious, carbon holds the answers to some of humanity's biggest questions. Where did Earth come from? What will ultimately become of it—and of us? With poetic storytelling, earth scientist Robert M. Hazen explores the universe to discover the past, present, and future of life's most essential element. We're not only "made of star stuff," as Carl Sagan famously observed, but "Big Bang stuff," too. Hazen reveals that carbon's grand symphony began with a frenzied prelude shortly after the dawn of creation, bringing new attention to the tiny number of Big Bang-created carbon atoms that often get overlooked. In minutes, violently colliding protons and neutrons improbably formed the first carbon atoms, which can still be found within our bodies. His book then unfolds in four movements, building momentum as he explores carbon as the element of Earth, Air, Fire, and Water. He visits the famed volcanic crater Solfatara di Pozzuoli near Naples, where venting carbon dioxide and other noxious fumes

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condense into beautiful crystals. He climbs the cliffs of the Scottish Highlands and delves deep into the precious-metal mines of Namibia, journeying toward Earth's mysterious core in search of undocumented carbon structures. Hazen often asks us to pause and consider carbon's role in climate change and what we can do about it, for our lives and this element are inextricably intertwined. With prose that sparkles like a diamond, *Symphony in C* tells the story of carbon, in which we all have a part.

### **The Universe Within**

Traces the friendship and collaborative achievements of 20th-century intellectuals Albert Camus and Jacques Monod, discussing their contributions to the French Resistance, Nobel Prize-winning work and passionate advocacy of human rights.

### **The Motion Paradox**

How science can convey a profound sense of wonder, connectedness, and optimism about the human condition. This book makes a compelling case that now more than ever the public at large needs to appreciate the critical-thinking tools that science has to offer and be educated in basic science literacy. The author emphasizes that the methods and facts of science are accessible to everyone, and that, contrary to popular belief, understanding science does not require extraordinary intelligence. He also notes that scientific rationality and critical thinking are not only good for our physical well-being but also are fully in sync with our highest moral codes. He illustrates the many ways in which the scientific worldview offers a profound sense of wonder, connectedness, and optimism about the human condition, an inspiring perspective that satisfies age-old spiritual aspirations. At a time of daunting environmental challenges and rampant misinformation, this book provides a welcome corrective and reason to hope for the future.

### **The Way of Science**

Darwin's theory of evolution was for more than a century dogged by a major problem: the evidence proving the connections between the main groups of organisms was nowhere to be found. By the 1970s this absence of 'transitional fossils' was hotly debated; some palaeontologists wondered if these 'missing links' had been so quick that no trace of them was left. However, during the past three decades fossils of walking whales from Pakistan, feathered dinosaurs from China, fish with feet from the Arctic Circle, ape-like humans from Africa, and many more bizarre creatures that fill in crucial gaps in our understanding of evolution have all been unearthed. *Written in Stone* shows how these discoveries have revolutionised palaeontology, and explores what its findings might mean for our place on earth.

### **Brave Genius**

Seventeen-year-old Arin Andrews shares all the hilarious, painful, and poignant details of undergoing gender reassignment as a high school student in this winning memoir. We've all felt uncomfortable in our own skin at some point, and we've all been told that "it's just a part of growing up." But for Arin Andrews, it wasn't a phase that would pass. He had been born in the body of a girl and there seemed to be no relief in sight... In this revolutionary memoir, Arin details the journey that led him to make the life-transforming decision to undergo gender

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reassignment as a high school junior. In his captivatingly witty, honest voice, Arin reveals the challenges he faced as a girl, the humiliation and anger he felt after getting kicked out of his private school, and all the changes—both mental and physical—he experienced once his transition began. Arin also writes about the thrill of meeting and dating a young transgender woman named Katie Hill...and the heartache that followed after they broke up. *Some Assembly Required* is a true coming-of-age story about knocking down obstacles and embracing family, friendship, and first love. But more than that, it is a reminder that self-acceptance does not come ready-made with a manual and spare parts. Rather, some assembly is always required.

### **Gene Machine**

A Harvard researcher investigates the human eye in this insightful account of what vision reveals about intelligence, learning, and the greatest mysteries of neuroscience. Spotting a face in a crowd is so easy, you take it for granted. But how you do it is one of science's great mysteries. And vision is involved with so much of everything your brain does. Explaining how it works reveals more than just how you see. In *We Know It When We See It*, Harvard neuroscientist Richard Masland tackles vital questions about how the brain processes information -- how it perceives, learns, and remembers -- through a careful study of the inner life of the eye. Covering everything from what happens when light hits your retina, to the increasingly sophisticated nerve nets that turn that light into knowledge, to what a computer algorithm must be able to do before it can be called truly "intelligent," *We Know It When We See It* is a profound yet approachable investigation into how our bodies make sense of the world.

### **The Tangled Tree**

Australopithecines, dinosaurs, trilobites--such fossils conjure up images of lost worlds filled with vanished organisms. But in the full history of life, ancient animals, even the trilobites, form only the half-billion-year tip of a nearly four-billion-year iceberg. Andrew Knoll explores the deep history of life from its origins on a young planet to the incredible Cambrian explosion, presenting a compelling new explanation for the emergence of biological novelty. The very latest discoveries in paleontology--many of them made by the author and his students--are integrated with emerging insights from molecular biology and earth system science to forge a broad understanding of how the biological diversity that surrounds us came to be. Moving from Siberia to Namibia to the Bahamas, Knoll shows how life and environment have evolved together through Earth's history. Innovations in biology have helped shape our air and oceans, and, just as surely, environmental change has influenced the course of evolution, repeatedly closing off opportunities for some species while opening avenues for others. Readers go into the field to confront fossils, enter the lab to discern the inner workings of cells, and alight on Mars to ask how our terrestrial experience can guide exploration for life beyond our planet. Along the way, Knoll brings us up-to-date on some of science's hottest questions, from the oldest fossils and claims of life beyond the Earth to the hypothesis of global glaciation and Knoll's own unifying concept of "permissive ecology." In laying bare Earth's deepest biological roots, *Life on a Young Planet* helps us understand our own place in the universe--and our responsibility as stewards of a world four billion years in the making. In a new preface, Knoll describes how the field has broadened and deepened in the decade since the book's original publication.

### **An Appetite for Wonder**

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The epic tale of an ancient, unsolved puzzle and how it relates to all scientific attempts to explain the basic structure of the universe At the dawn of science the ancient Greek philosopher Zeno formulated his paradox of motion, and amazingly, it is still on the cutting edge of all investigations into the fabric of reality. Zeno used logic to argue that motion is impossible, and at the heart of his maddening puzzle is the nature of space and time. Is space-time continuous or broken up like a string of beads? Over the past two millennia, many of our greatest minds—including Aristotle, Galileo, Newton, Einstein, Stephen Hawking, and other current theoreticians—have been gripped by the mystery this puzzle represents. Joseph Mazur, acclaimed author of *Euclid in the Rainforest*, shows how historic breakthroughs in our understanding of motion shed light on Zeno's paradox. The orbits of the planets were explained, the laws of motion were revealed, the theory of relativity was discovered—but the basic structure of time and space remained elusive. In the tradition of *Fermat's Enigma* and *Zero*, *The Motion Paradox* is a lively history of this apparently simple puzzle whose solution—if indeed it can be solved—will reveal nothing less than the fundamental nature of reality.

### Human Errors

A profound meditation on climate change and the Anthropocene and an urgent search for the fossils—industrial, chemical, geological—that humans are leaving behind What will the world look like in ten thousand years—or ten million? What kinds of stories will be told about us? In *Footprints: In Search of Future Fossils*, the award-winning author David Farrier explores the traces we will leave for the very distant future. Modern civilization has created objects and landscapes with the potential to endure through deep time, whether it is plastic polluting the oceans and nuclear waste sealed within the earth or the 30 million miles of roads spanning the planet. Our carbon could linger in the atmosphere for 100,000 years, and the remains of our cities will still exist millions of years from now as a layer in the rock. These future fossils have the potential to reveal much about how we lived in the twenty-first century. Crossing the boundaries of literature, art, and science, *Footprints* invites us to think about how we will be remembered in the myths and stories of our distant descendants. Traveling from the Baltic Sea to the Great Barrier Reef, and from an ice-core laboratory in Tasmania to Shanghai, one of the world's biggest cities, Farrier describes a world that is changing rapidly, with consequences beyond the scope of human understanding. As much a message of hope as a warning, *Footprints* will not only alter how you think about the future; it will change how you see the world today.

### The Deep History of Ourselves

Instant New York Times Best-seller From the world-renowned physicist and best-selling author of *The Elegant Universe* comes a captivating exploration of deep time and humanity's search for purpose. "Few humans share Greene's mastery of both the latest cosmological science and English prose." —The New York Times (notable book of 2020) *Until the End of Time* is Brian Greene's breathtaking new exploration of the cosmos and our quest to find meaning in the face of this vast expanse. Greene takes us on a journey from the big bang to the end of time, exploring how lasting structures formed, how life and mind emerged, and how we grapple with our existence through narrative, myth, religion, creative expression, science, the quest for truth, and a deep longing for the eternal. From particles to planets, consciousness to creativity, matter to meaning—Brian Greene allows us all to grasp and appreciate our fleeting but utterly exquisite moment in the cosmos.

## Oxygen

An illuminating, entertaining tour of the physical imperfections that make us human. We humans like to think of ourselves as highly evolved creatures. But if we are supposedly evolution's greatest creation, why do we have such bad knees? Why do we catch head colds so often—two hundred times more often than a dog does? How come our wrists have so many useless bones? Why is the vast majority of our genetic code pointless? And are we really supposed to swallow and breathe through the same narrow tube? Surely there's been some kind of mistake. As professor of biology Nathan H. Lents explains in *Human Errors*, our evolutionary history is nothing if not a litany of mistakes, each more entertaining and enlightening than the last. The human body is one big pile of compromises. But that is also a testament to our greatness: as Lents shows, humans have so many design flaws precisely because we are very, very good at getting around them. A rollicking, deeply informative tour of humans' four billion year long evolutionary saga, *Human Errors* both celebrates our imperfections and offers an unconventional accounting of the cost of our success.

## Origins

Oxygen has had extraordinary effects on life. Three hundred million years ago, in Carboniferous times, dragonflies grew as big as seagulls, with wingspans of nearly a metre. Researchers claim they could have flown only if the air had contained more oxygen than today - probably as much as 35 per cent. Giant spiders, tree-ferns, marine rock formations and fossil charcoals all tell the same story. High oxygen levels may also explain the global firestorm that contributed to the demise of the dinosaurs after the asteroid impact. The strange and profound effects that oxygen has had on the evolution of life pose a riddle, which this book sets out to answer. Oxygen is a toxic gas. Divers breathing pure oxygen at depth suffer from convulsions and lung injury. Fruit flies raised at twice normal atmospheric levels of oxygen live half as long as their siblings. Reactive forms of oxygen, known as free radicals, are thought to cause ageing in people. Yet if atmospheric oxygen reached 35 per cent in the Carboniferous, why did it promote exuberant growth, instead of rapid ageing and death? *Oxygen* takes the reader on an enthralling journey, as gripping as a thriller, as it unravels the unexpected ways in which oxygen spurred the evolution of life and death. The book explains far more than the size of ancient insects: it shows how oxygen underpins the origin of biological complexity, the birth of photosynthesis, the sudden evolution of animals, the need for two sexes, the accelerated ageing of cloned animals like Dolly the sheep, and the surprisingly long lives of bats and birds. Drawing on this grand evolutionary canvas, *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. The result is a captivating vision of contemporary science and a humane synthesis of our place in nature. This remarkable book will redefine the way we think about the world.

## Teaching Evolution in a Creation Nation

How did flying birds evolve from running dinosaurs, terrestrial trotting tetrapods evolve from swimming fish, and whales return to swim in the sea? These are some of the great transformations in the 500-million-year history of vertebrate life. And with the aid of new techniques and approaches across a range of fields—work spanning multiple levels of biological organization from DNA sequences to organs and the physiology and ecology of whole

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organisms—we are now beginning to unravel the confounding evolutionary mysteries contained in the structure, genes, and fossil record of every living species. This book gathers a diverse team of renowned scientists to capture the excitement of these new discoveries in a collection that is both accessible to students and an important contribution to the future of its field. Marshaling a range of disciplines—from paleobiology to phylogenetics, developmental biology, ecology, and evolutionary biology—the contributors attack particular transformations in the head and neck, trunk, appendages such as fins and limbs, and the whole body, as well as offer synthetic perspectives. Illustrated throughout, *Great Transformations in Vertebrate Evolution* not only reveals the true origins of whales with legs, fish with elbows, wrists, and necks, and feathered dinosaurs, but also the relevance to our lives today of these extraordinary narratives of change.

### **Great Transformations in Vertebrate Evolution**

The darkly funny memoir of Sarah Ramey's years-long battle with a mysterious illness that doctors thought was all in her head—but wasn't. A revelation and an inspiration for millions of women whose legitimate health complaints are ignored. In her harrowing, defiant, and unforgettable memoir, Sarah Ramey recounts the decade-long saga of how a seemingly minor illness in her senior year of college turned into a prolonged and elusive condition that destroyed her health but that doctors couldn't diagnose or treat. Worse, as they failed to cure her, they hinted that her devastating symptoms were psychological. *The Lady's Handbook for Her Mysterious Illness* is a memoir with a mission: to help the millions of (mostly) women who suffer from unnamed or misunderstood conditions--autoimmune illnesses, fibromyalgia and chronic fatigue syndrome, chronic Lyme disease, chronic pain, and many more. Ramey's pursuit of a diagnosis and cure for her own mysterious illness becomes a page-turning medical mystery that reveals a new understanding of today's chronic illnesses as ecological in nature, driven by modern changes to the basic foundations of health, from the quality of our sleep, diet, and social connections to the state of our microbiomes. Her book will open eyes, change lives, and, ultimately, change medicine.

### **Field Notes from an Unintentional Birder**

In this New York Times bestseller and longlist nominee for the National Book Award, “our greatest living chronicler of the natural world” (The New York Times), David Quammen explains how recent discoveries in molecular biology affect our understanding of evolution and life's history. In the mid-1970s, scientists began using DNA sequences to reexamine the history of all life. Perhaps the most startling discovery to come out of this new field—the study of life's diversity and relatedness at the molecular level—is horizontal gene transfer (HGT), or the movement of genes across species lines. It turns out that HGT has been widespread and important; we now know that roughly eight percent of the human genome arrived sideways by viral infection—a type of HGT. In *The Tangled Tree*, “the grandest tale in biology....David Quammen presents the science—and the scientists involved—with patience, candor, and flair” (Nature). We learn about the major players, such as Carl Woese, the most important little-known biologist of the twentieth century; Lynn Margulis, the notorious maverick whose wild ideas about “mosaic” creatures proved to be true; and Tsutomu Wantanabe, who discovered that the scourge of antibiotic-resistant bacteria is a direct result of horizontal gene transfer, bringing the deep study of genome histories to bear on a global crisis in public health. “David Quammen proves to be an immensely well-informed guide to a complex story” (The Wall Street Journal). In *The Tangled Tree*, he explains how molecular studies of evolution have brought startling recognitions about the tangled tree of life—including where we humans fit upon

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it. Thanks to new technologies, we now have the ability to alter even our genetic composition—through sideways insertions, as nature has long been doing. “The Tangled Tree is a source of wonder....Quammen has written a deep and daring intellectual adventure” (The Boston Globe).

### **We Know It When We See It**

A natural history of the wilderness in our homes, from the microbes in our showers to the crickets in our basements Even when the floors are sparkling clean and the house seems silent, our domestic domain is wild beyond imagination. In *Never Home Alone*, biologist Rob Dunn introduces us to the nearly 200,000 species living with us in our own homes, from the Egyptian meal moths in our cupboards and camel crickets in our basements to the lactobacillus lounging on our kitchen counters. You are not alone. Yet, as we obsess over sterilizing our homes and separating our spaces from nature, we are unwittingly cultivating an entirely new playground for evolution. These changes are reshaping the organisms that live with us -- prompting some to become more dangerous, while undermining those species that benefit our bodies or help us keep more threatening organisms at bay. No one who reads this engrossing, revelatory book will look at their homes in the same way again.

### **Improbable Destinies**

A once-successful behavioral health professional battles addiction and chronic pain and ultimately finds recovery from both.

### **Never Home Alone**

Our understanding of vertebrate origins and the backbone of human history evolves with each new fossil find and DNA map. Many species have now had their genomes sequenced, and molecular techniques allow genetic inspection of even non-model organisms. But as longtime *Nature* editor Henry Gee argues in *Across the Bridge*, despite these giant strides and our deepening understanding of how vertebrates fit into the tree of life, the morphological chasm between vertebrates and invertebrates remains vast and enigmatic. As Gee shows, even as scientific advances have falsified a variety of theories linking these groups, the extant relatives of vertebrates are too few for effective genetic analysis. Moreover, the more we learn about the species that do remain—from sea-squirts to starfish—the clearer it becomes that they are too far evolved along their own courses to be of much use in reconstructing what the latest invertebrate ancestors of vertebrates looked like. Fossils present yet further problems of interpretation. Tracing both the fast-changing science that has helped illuminate the intricacies of vertebrate evolution as well as the limits of that science, *Across the Bridge* helps us to see how far the field has come in crossing the invertebrate-to-vertebrate divide—and how far we still have to go.

### **The Dance of Life**

'Quite simply the best book about science and life that I have ever read' - Alice Roberts How does life begin? What drives a newly fertilized egg to keep dividing and growing until it becomes 40 trillion cells, a greater number than stars in the galaxy? How do these cells know how to make a human, from lips to heart to toes? How does your body build itself? Magdalena Zernicka-Goetz was pregnant at 42 when a routine genetic test came back with that dreaded

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word: abnormal. A quarter of sampled cells contained abnormalities and she was warned her baby had an increased risk of being miscarried or born with birth defects. Six months later she gave birth to a healthy baby boy and her research on mice embryos went on to prove that – as she had suspected – the embryo has an amazing and previously unknown ability to correct abnormal cells at an early stage of its development. The Dance of Life will take you inside the incredible world of life just as it begins and reveal the wonder of the earliest and most profound moments in how we become human. Through Magda's trailblazing research as a professor at Cambridge – where she has doubled the survival time of human embryos in the laboratory, and made the first artificial embryo-like structures from stem cells – you'll discover how early life is programmed to repair and organise itself, what this means for the future of pregnancy, and how we might one day solve IVF disorders, prevent miscarriages and learn more about the dance of life as it starts to take shape. The Dance of Life is a moving celebration of the balletic beauty of life's beginnings.

### What Color Is My World?

A Nobel Prize-winning biologist tells the riveting story of his race to discover the inner workings of biology's most important molecule "Ramakrishnan's writing is so honest, lucid and engaging that I could not put this book down until I had read to the very end."--Siddhartha Mukherjee, author of *The Emperor of All Maladies* and *The Gene* Everyone has heard of DNA. But by itself, DNA is just an inert blueprint for life. It is the ribosome--an enormous molecular machine made up of a million atoms--that makes DNA come to life, turning our genetic code into proteins and therefore into us. *Gene Machine* is an insider account of the race for the structure of the ribosome, a fundamental discovery that both advances our knowledge of all life and could lead to the development of better antibiotics against life-threatening diseases. But this is also a human story of Ramakrishnan's unlikely journey, from his first fumbling experiments in a biology lab to being the dark horse in a fierce competition with some of the world's best scientists. In the end, *Gene Machine* is a frank insider's account of the pursuit of high-stakes science.

### Oxygen

"THE ULTIMATE DINOSAUR BIOGRAPHY," hails *Scientific American*: A thrilling new history of the age of dinosaurs, from one of our finest young scientists. A New York Times Bestseller • Goodreads Choice Awards WINNER A BEST BOOK OF THE YEAR: Smithsonian, NPR Science Friday, The Times (London), Popular Mechanics, Science News, Library Journal, Booklist, and Chicago Public Library "A masterpiece of science writing." —Washington Post "This is scientific storytelling at its most visceral, striding with the beasts through their Triassic dawn, Jurassic dominance, and abrupt demise in the Cretaceous." —Nature The dinosaurs. Sixty-six million years ago, the Earth's most fearsome creatures vanished. Today they remain one of our planet's great mysteries. Now *The Rise and Fall of the Dinosaurs* reveals their extraordinary, 200-million-year-long story as never before. In this captivating narrative (enlivened with more than seventy original illustrations and photographs), Steve Brusatte, a young American paleontologist who has emerged as one of the foremost stars of the field—naming fifteen new species and leading groundbreaking scientific studies and fieldwork—masterfully tells the complete, surprising, and new history of the dinosaurs, drawing on cutting-edge science to dramatically bring to life their lost world and illuminate their enigmatic origins, spectacular flourishing, astonishing diversity, cataclysmic extinction, and startling living legacy. Captivating and revelatory, *The Rise and Fall of the Dinosaurs* is a book for the ages. Brusatte traces the evolution of dinosaurs from their inauspicious start as small

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shadow dwellers—themselves the beneficiaries of a mass extinction caused by volcanic eruptions at the beginning of the Triassic period—into the dominant array of species every wide-eyed child memorizes today, T. rex, Triceratops, Brontosaurus, and more. This gifted scientist and writer re-creates the dinosaurs' peak during the Jurassic and Cretaceous, when thousands of species thrived, and winged and feathered dinosaurs, the prehistoric ancestors of modern birds, emerged. The story continues to the end of the Cretaceous period, when a giant asteroid or comet struck the planet and nearly every dinosaur species (but not all) died out, in the most extraordinary extinction event in earth's history, one full of lessons for today as we confront a "sixth extinction." Brusatte also recalls compelling stories from his globe-trotting expeditions during one of the most exciting eras in dinosaur research—which he calls "a new golden age of discovery"—and offers thrilling accounts of some of the remarkable findings he and his colleagues have made, including primitive human-sized tyrannosaurs; monstrous carnivores even larger than T. rex; and paradigm-shifting feathered raptors from China. An electrifying scientific history that unearths the dinosaurs' epic saga, *The Rise and Fall of the Dinosaurs* will be a definitive and treasured account for decades to come. Includes 75 images, world maps of the prehistoric earth, and a dinosaur family tree.

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