



NON-FICTION

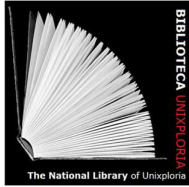
The Voyage of the Beagle (1845) and The Origin of Species (1859) by Charles Darwin

One of the most delightful, witty, and beautifully written of all-natural histories, *The Voyage of the Beagle* recounts the young Darwin's 1831 to 1836 trip to South America, the Galápagos Islands, Australia, and back again to England. This journey transformed his understanding of biology and fed the development of his ideas about evolution. Fossils spring to life on the page as Darwin describes his adventures, including encounters with "savages" in Tierra del Fuego, an accidental meal of a rare bird in Patagonia (which was then named in Darwin's honor), and wobbly attempts to ride Galápagos tortoises.

Yet Darwin's masterwork is, undeniably, *The Origin of Species*, in which he introduced his theory of evolution by natural selection. Before its publication, the prevailing view was that each species had existed in its current form since the moment of divine creation and that humans were a privileged form of life, above and apart from nature. Darwin's theory knocked us from that pedestal. Wary of a religious backlash, he kept his ideas secret for almost two decades while bolstering them with additional observations and experiments. The result is an avalanche of detail — there seems to be no species he did not contemplate — thankfully delivered in accessible, conversational prose. A century and a half later, Darwin's paean to evolution still begs to be heard: "There is grandeur in this view of life," he wrote, that "from so simple a beginning endless forms most beautiful and most wonderful have been, and are being, evolved."

"The most important science book of all time. Darwin revolutionized our understanding of life, the relationship of humanity to all creatures in the world, and the mythological foundation of all religions."

— geneticist Lee M. Silver, Princeton University



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Philosophiae Naturalis Principia Mathematica (Mathematical Principles of Natural Philosophy) by Isaac Newton (1687)

Dramatic is an unlikely word for a book that devotes half its pages to deconstructions of ellipses, parabolas, and tangents. Yet the cognitive power on display here can trigger chills. Principia marks the dawn of modern physics, beginning with the familiar three laws of motion ("To every action, there is always opposed an equal reaction" is the third). Later Newton explains the eccentric paths of comets, notes the similarity between sound waves and ripples on a pond, and makes his famous case that gravity guides the moon's orbit as it defines the arc of a tossed pebble. The text is dry but accessible to anyone with a high school education — and the opportunity to commune with perhaps the top genius in the history of science.

"You don't have to be a Newton junkie like me to find it gripping. How amazing is it that this guy was able to figure out that the same force that lets a bird poop on your head governs the motions of planets in the heavens? That is towering genius, no?"

— psychiatrist Richard A. Friedman, Cornell University

Dialogue Concerning the Two Chief World Systems by Galileo Galilei (1632)

Pope Urban VIII sanctioned Galileo to write a neutral treatise on Copernicus's new, sun-centered view of the solar system. Galileo responded with this cheeky conversation between three characters: a supporter of Copernicus, an educated layman, and an old-fashioned follower of Aristotle. This last one — a dull thinker named Simplicio — represented the church's position, and Galileo was soon standing before the Inquisition. Galileo comes across as a masterful raconteur; his discussions of recent astronomical findings, in particular, evoke an electrifying sense of discovery. The last section, in which he erroneously argues that ocean tides prove Earth is in motion, is fascinatingly shoddy by comparison. Galileo, trying to deliver a fatal blow to the church's Aristotelian



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thinking, got tripped up by his faith in an idea he was sure was true but couldn't prove.

"It's not only one of the most influential books in the history of the world but a wonderful read. It was clear, entertaining, moving, and often hilarious. It showed early on how science writing needn't be stuffy."

— cognitive scientist Steven Pinker, Harvard University

De Revolutionibus Orbium Coelestium (On the Revolutions of Heavenly Spheres) by Nicolaus Copernicus (1543)

Copernicus waited until he was on his deathbed to publish this volume, then prefaced it with a ring-kissing letter to Pope Paul III explaining why the work wasn't heresy. No furor ensued until long after Copernicus's death when Galileo's run-in with the church landed *De Revolutionibus* on the Inquisition's index of forbidden books (see #4, above).

By arguing that Earth and the other planets move around the sun (rather than everything revolving around Earth), Copernicus sparked a revolution in which scientific thought first dared to depart from religious dogma. While no longer forbidden, *De Revolutionibus* is hardly user-friendly. The book's title page gives fair warning: "Let no one untrained in geometry enter here."

Physica (Physics) by Aristotle (circa 330 B.C.)

By contrast, Aristotle placed Earth firmly at the center of the cosmos and viewed the universe as a neat set of nested spheres. He also mistakenly concluded that things move differently on Earth and in the heavens. Nevertheless, *Physica*, Aristotle's treatise on the nature of motion, change, and time stands out because he presented a systematic way of studying the natural world — one that held sway for two millennia and led to the modern scientific method.



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"Aristotle opened the door to the empirical sciences, in contrast to Platonism's love of pure reason. You cannot overestimate his influence on the West and the world."

—bioethicist Arthur Caplan, University of Pennsylvania

De Humani Corporis Fabrica (On the Fabric of the Human Body) by Andreas Vesalius (1543)

In 1543, when Copernicus's *De Revolutionibus* appeared, anatomist Andreas Vesalius published the world's first comprehensive illustrated anatomy textbook. For centuries, anatomists had dissected the human body according to instructions spelled out by ancient Greek texts. Vesalius dispensed with that dusty methodology and conducted his dissections, reporting findings that departed from the ancients' on numerous points of anatomy. The hundreds of illustrations, many rendered in meticulous detail by students of Titian's studio, are captivating.

Relativity: The Special and General Theory by Albert Einstein (1916)

Albert Einstein's theories overturned long-held notions about bodies in motion. Time and space, he showed, are not absolutes. A moving yardstick shrinks in flight; a clock mounted on that yardstick runs slow. *Relativity*, written for those not acquainted with the underlying math, reveals Einstein as a skillful popularizer of his ideas.

To explain the particular theory of relativity, Einstein invites us on board a train filled with rulers and clocks; for the more complex general idea, we career in a cosmic elevator through space. As Einstein warns in his preface, however, the book demands "a fair amount of patience and force of will on the part of the reader."



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The Selfish Gene by Richard Dawkins (1976)

In this enduring popularization of evolutionary biology, Dawkins argues that our genes do not exist to perpetuate us; instead, we are valuable machines that serve to perpetuate them. This unexpected shift in perspective, a "gene's-eye view of nature," is an enjoyable --brainteaser for the uninitiated. So is a related notion: that altruistic behavior in animals does not evolve for "the good of the species" but is selfishness in disguise. "Like successful Chicago gangsters," Dawkins writes, "our genes have survived in a highly competitive world in some cases for millions of years."

One Two Three. Infinity by George Gamow (1947)

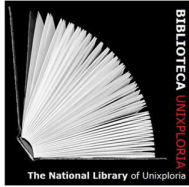
Illustrating these tales with his charming sketches, renowned Russian-born physicist Gamow covers the gamut of science from the Big Bang to the curvature of space and the amount of mysterious genetic material in our bodies (DNA had not yet been described). No one can read this book and conclude that science is dull. Who but a physicist would analyze the atomic constituents of genetic material and calculate how much all that material if extracted from every cell in your body, would weigh? (The answer is less than two ounces.)

"Influenced my decision to become a physicist and is part of why I write books for the public today."

— theoretical physicist Lawrence M. Krauss, Case Western Reserve University

The Double Helix by James D. Watson (1968)

The Double Helix takes us inside a pell-mell race whose winners were almost guaranteed fame and a Nobel Prize. James Watson's frank and often frankly rude account of his role in discovering the structure of DNA infuriated nearly everyone whose name appeared in it. Still, it nonetheless ranks as a first-rate piece of science writing.



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Most poignant are Watson's disparaging descriptions of his encounters with DNA researcher Rosalind Franklin. Her X-ray crystallography images showed the molecule as a helix, crucial data that Watson and his collaborator Francis Crick "borrowed" to construct their DNA model. Franklin died of ovarian cancer in 1958, losing out on the 1962 Nobel Prize for the discovery. Perhaps to atone, Watson noted her crucial contribution in the epilogue to his book.

"The telenovela of my generation of geneticists."

— geneticist Mary-Claire King, University of Washington

What Is Life? by Erwin Schrödinger (1944)

Long a classic among biologists, this volume describes, from the perspective of a Nobel Prize-winning physicist, how living organisms differ from inanimate objects like crystals. Schrödinger carefully outlines how the two groups obey different laws and puzzles over what the "paragon of orderliness" of living things may signify. Some editions include an autobiographical sketch in which Schrödinger describes the conflict over teaching Darwin that raged when he was in school and his fascination with evolution.

"What Is Life? is what got Francis Crick and the other pioneers of molecular biology in the 1950s interested in the problem in the first place."

— cognitive scientist Steven Pinker, Harvard University

The Cosmic Connection by Carl Sagan (1973)

When NASA was reeling from the end of the Apollo program, Sagan reacquainted both the public and his colleagues with the majesty of the universe, starting with the oft-overlooked worlds of our solar system.

He also championed the search for extraterrestrial life and argued for the likelihood of planets around other stars two decades before they were discovered. The T.V. series *Cosmos* brought Sagan to the masses, but the adventure began here.



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The Insect Societies by Edward O. Wilson (1971)

The patriarch of modern evolutionary biology explores the lives of everyone's favorite creepy crawlies — ants, termites, bees, and wasps — in this 500-page treatise unmatched in scope and detail by any other work on the topic (with the possible exception of his own 1990 volume, *The Ants*).

It also lays the groundwork for his 1975 classic, *Sociobiology: The New Synthesis*, which explores the then-controversial idea that the social behavior of animals, including humans, has a profound biological basis. The book is a labor of love, infused with the author's boundless fascination for his tiny subjects. Wilson openly acknowledges the quirkiness of his obsession; the dedication reads, "For my wife Irene, who understands."

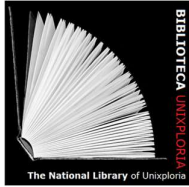
The First Three Minutes by Steven Weinberg (1977)

When Weinberg was a student, "the study of the early universe was widely regarded as not the sort of thing a respectable scientist would devote his time." But after World War II, radar researchers turned their instruments to the sky and helped bring creation stories out of myth and into the realm of science.

Weinberg, the winner of the 1979 Nobel Prize in Physics, offered the first authoritative, popular account of the resulting Big Bang scenario in *The First Three Minutes*. A 1993 afterword discusses more recent advances. Amazingly, only the description of the first fraction of a second of cosmic history has changed significantly.

Silent Spring by Rachel Carson (1962)

When *Silent Spring* was first published, a chorus of critics called Carson "hysterical" and "extremist." Yet the marine biologist's meticulously documented indictment of DDT led both to a U.S. ban on the insecticide and the birth of the modern environmental movement. Carson argues that DDT indiscriminately kills insects, including beneficial species like bees, and



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accumulates in the fat of birds and mammals high on the food chain, thinning eggshells and causing reproductive problems.

Her chilling vision of a birdless America is still haunting. "Over increasingly large areas of the United States," she writes, "spring now comes unheralded by the return of the birds, and the early mornings are strangely silent where once they were filled with the beauty of birdsong."

The Mismeasure of Man by Stephen Jay Gould (1981)

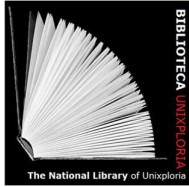
In this witty critique of bad science, Harvard scholar Stephen Jay Gould sets out to eviscerate the notion of biological determinism. For hundreds of years, Gould argues, questionable measurements of human intelligence, like skull size or I.Q., have been used to justify racism, sexism, and class stratification.

According to Gould, even respected sociologists and psychologists have used falsified or shaky data to support the belief that Westerners are genetically predisposed to rule the world. The book drew political and scientific criticism, especially from social scientists furious that Gould had oversimplified or demonized their work.

The Man Who Mistook His Wife for a Hat and Other Clinical Tales by Oliver Sacks (1985)

In these profiles of patients with unusual neurological disorders, Sacks revolutionizes the centuries-old literary tradition of presenting clinical case studies. Far from dryly reporting each case, the eminent British-born New York City neurologist writes in lively prose with the gentle affection of a country doctor on a house call and a contagious sense of wonder.

To him, the hero of the stories is the man with Tourette's syndrome and the woman who cannot sense her own body position. Legions of neuroscientists now probing the mysteries of the human brain cite this book as their greatest inspiration.



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The Journals of Lewis and Clark by Meriwether Lewis and William Clark (1814)

One of history's most famous tales of exploration began on May 14, 1804, when William Clark and his Corps of Discovery set off from the mouth of the Missouri River, beginning an epic 28-month journey west to the shores of the Pacific Ocean. (Meriwether Lewis joined the group two days later.) The Journals, a meticulous chronicle of their expedition, offer an unprecedented glimpse at new, undeveloped America west of the Mississippi.

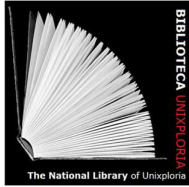
Lewis, the group's naturalist, astronomer, and Clark, the surveyor, documented new species of wildlife (coyotes, jackrabbits, mule deer, and others), unfamiliar geology, and interactions with native peoples. A complete copy of the Journals and their companion material is heavy reading (the definitive Nebraska edition has 13 volumes). Still, an abridged version captures all the adventure in a palatably sized package.

The Feynman Lectures on Physics by Richard P. Feynman, Robert B. Leighton, and Matthew Sands (1963)

Not only did physicist Richard Feynman win the 1965 Nobel Prize for his work on quantum electrodynamics, he once played bongos for a San Francisco ballet. The beloved book Surely You're Joking, Mr. Feynman! He recounts his raucous adventures, but these undergraduate physics lectures, presented over two years at Caltech in the 1960s, are Feynman's true gift to students.

The first 94 lectures cover a wide swath of fundamental physics, from Newtonian mechanics to electromagnetism, while the final 21 venture into quantum mechanics. Feynman's characteristic humor and peerless explanations elevate these classroom lessons to enduring classics.

"Feynman, the prankster-genius, appeals no matter what field you're in. It helps to know some basic physics to approach his lectures. Still, he has such a luminous mind and is so good with a metaphor that you can grasp a fair



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amount about what's going on in modern physics without a proper understanding of complex math; up to a point."

— psychiatrist Richard A. Friedman, Cornell University

Sexual Behavior in the Human Male by Alfred C. Kinsey et al. (1948)

The first of two books known collectively as the Kinsey Report, this treatise became an improbable best-seller. With raw, technical descriptions of sexual acts, distilled from thousands of interviews, it documented what people really do behind closed doors for the first time.

Many researchers consider the book flawed because of its sampling bias: Most men interviewed were young, white, and eager to participate. Nevertheless, the work remains an outstanding model of scientific bravery in the 20th century, with its insistence that sexual acts be described as healthy functions of the human body and that cultural taboos do not stand in the way of science.

Gorillas in the Mist by Dian Fossey (1983)

In a richly hued portrait of the lives and behavior of African mountain gorillas, Fossey documents her 13 years of dwelling in a remote rain forest amid these enigmatic animals. One of a trio of protégés picked by famed anthropologist Louis Leakey to conduct field studies of great apes, Fossey was determined, devoted, and often angry — over the apes' diminishing habitat and especially over the danger they faced from poachers (who may have been responsible for Fossey's 1985 murder). In *Gorillas*, she leaves behind a scientific treasure, one rendered more poignant by her death in the service of these peaceful, intelligent beasts.



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Under a Lucky Star by Roy Chapman Andrews (1943)

Roy Chapman Andrews made scientific history during the 1920s by leading five motorized expeditions into unexplored reaches of the Gobi desert. He emerged with the equivalent of paleontological gold: more than 350 new species (including the dinosaurs Protoceratops and Velociraptor), the first fossils of Cretaceous mammals, and the first nests of dinosaur eggs.

He also packed out plenty of wild tales, which are woven into this engaging autobiography. Rumors persist that the fedora-wearing, snake-hating, death-defying explorer may have served as the inspiration for Hollywood's Indiana Jones.

Micrographia by Robert Hooke (1665)

A revelation in its time, *Micrographia* exposed the previously hidden microscopic world. Hooke, an early developer of the compound microscope, used his device to peer at the eyes of flies, the stinger on a bee, hairs, bristles, sand particles, seeds, and more, noting every detail with both words and masterful illustrations.

The original book is a hefty three pounds, so the available digital versions are more convenient, but there is something to be said for flipping through a printed copy and discovering, like a hidden treasure, each drawing in its beautiful intricacy.

Gaia by James Lovelock (1979)

James Lovelock may seem an unlikely figure to have launched a New Age, earth-mother environmental movement as an inventor of scientific instruments. Yet that's precisely what he accomplished with *Gaia: A New Look at Life on Earth*. In it, Lovelock laid out his bold idea that our planet is a single, self-regulating system, dubbed Gaia, wherein "the entire range of living matter on Earth, from whales to viruses, and from oaks to algae, could be regarded as



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constituting a single living entity, capable of manipulating the Earth's atmosphere to suit its overall needs."

Lovelock has since refined the hypothesis, which many scientists criticized as quasi-mystical, and notes that he never implied that Gaia was a sentient being.

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