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The Day We Found the Universe **Archives of the Universe** Thursday's Universe Through a Universe Darkly **Dispatches from Planet 3 Coming of Age in the Milky Way** *Thursday's Universe* **Mind of God Mapping the Heavens** E = Einstein **First Dawn** Black Hole *Einstein's Telescope: The Hunt for Dark Matter and Dark Energy in the Universe* Frozen Star Brilliant Blunders **The Science of Shakespeare** Finding Our Place in the Universe **What Stars Are Made Of First Light** Fundamentals **Through a Universe Darkly** Dante and the Early Astronomer **Archives of the Universe** *Secrets of the Universe* **The Realm of the Nebulae** Wrinkles in Time Einstein's Monsters: The Life and Times of Black Holes **Ripples in Spacetime** *Cosmic Odyssey* Universe in Creation **The Perfect Theory Edwin Hubble** *Stephen Hawking: An Unfettered Mind* **Near-Earth Objects** Flashes of Creation *Warped Passages* **The Sky Is for Everyone** *Searching for the Oldest Stars Einstein's Unfinished Symphony* **Neutrino Hunters**

Black Hole Nov 20 2021 The contentious history of the idea of the black hole the most fascinating and bizarre celestial object in the heavens For more than half a century, physicists and astronomers engaged in heated dispute over the

possibility of black holes in the universe. The weirdly alien notion of a space-time abyss from which nothing escapes not even light seemed to confound all logic. This engrossing book tells the story of the fierce black hole debates and the contributions of Einstein and Hawking and other leading thinkers who completely altered our view of the universe. Renowned science writer Marcia Bartusiak shows how the black hole helped revive Einstein s greatest achievement, the general theory of relativity, after decades during which it had been pushed into the shadows. Not until astronomers discovered such surprising new phenomena as neutron stars and black holes did the once-sedate universe transform into an Einsteinian cosmos, filled with sources of titanic energy that can be understood only in the light of relativity. This book celebrates the hundredth anniversary of general relativity, uncovers how the black hole really got its name, and recounts the scientists frustrating, exhilarating, and at times humorous battles over the acceptance of one of history s most dazzling ideas."

Einstein's Monsters: The Life and Times of Black Holes Aug 06 2020 The astonishing science of black holes and their role in understanding the history and future of our universe. Black holes are the most extreme objects in the universe, and yet they are ubiquitous. Every massive star leaves behind a black hole when it dies, and every galaxy harbors a supermassive black hole at its center. Frighteningly enigmatic, these dark giants continue to astound even the scientists who spend their careers studying them. Which came first, the galaxy or its central black hole? What happens if you travel into one—instant death or something weirder? And, perhaps most important, how can we ever know anything for sure about black holes when they destroy information by their very nature? In Einstein’s Monsters, distinguished astronomer Chris Impey takes readers on an exploration of these and other questions at the cutting edge of

astrophysics, as well as the history of black holes' role in theoretical physics—from confirming Einstein's equations for general relativity to testing string theory. He blends this history with a poignant account of the phenomena scientists have witnessed while observing black holes: stars swarming like bees around the center of our galaxy; black holes performing gravitational waltzes with visible stars; the cymbal clash of two black holes colliding, releasing ripples in space-time. Clear, compelling, and profound, Einstein's Monsters reveals how our comprehension of black holes is intrinsically linked to how we make sense of the universe and our place within it. From the small questions to the big ones—from the tiniest particles to the nature of space-time itself—black holes might be the key to a deeper understanding of the cosmos.

The Science of Shakespeare Jul 17 2021 William Shakespeare lived at a remarkable time—a period we now recognize as the first phase of the Scientific Revolution. New ideas were transforming Western thought, the medieval was giving way to the modern, and the work of a few key figures hinted at the brave new world to come: the methodical and rational Galileo, the skeptical Montaigne, and—as Falk convincingly argues—Shakespeare, who observed human nature just as intently as the astronomers who studied the night sky. In The Science of Shakespeare, we meet a colorful cast of Renaissance thinkers, including Thomas Digges, who published the first English account of the "new astronomy" and lived in the same neighborhood as Shakespeare; Thomas Harriot—"England's Galileo"—who aimed a telescope at the night sky months ahead of his Italian counterpart; and Danish astronomer Tycho Brahe, whose observatory-castle stood within sight of Elsinore, chosen by Shakespeare as the setting for Hamlet—and whose family crest happened to include the names "Rosencrans" and "Guildensteren." And then

there's Galileo himself: As Falk shows, his telescopic observations may have influenced one of Shakespeare's final works. Dan Falk's The Science of Shakespeare explores the connections between the famous playwright and the beginnings of the Scientific Revolution—and how, together, they changed the world forever.

The Sky Is for Everyone Sep 26 2019 An inspiring anthology of writings by trailblazing women astronomers from around the globe The Sky Is for Everyone is an internationally diverse collection of autobiographical essays by women who broke down barriers and changed the face of modern astronomy. Virginia Trimble and David Weintraub vividly describe how, before 1900, a woman who wanted to study the stars had to have a father, brother, or husband to provide entry, and how the considerable intellectual skills of women astronomers were still not enough to enable them to pry open doors of opportunity for much of the twentieth century. After decades of difficult struggles, women are closer to equality in astronomy than ever before. Trimble and Weintraub bring together the stories of the tough and determined women who flung the doors wide open. Taking readers from 1960 to today, this triumphant anthology serves as an inspiration to current and future generations of women scientists while giving voice to the history of a transformative era in astronomy. With contributions by Neta A. Bahcall, Beatriz Barbuy, Ann Merchant Boesgaard, Jocelyn Bell Burnell, Catherine Cesarsky, Poonam Chandra, Xuefei Chen, Cathie Clarke, Judith Gamora Cohen, France Anne Córdova, Anne Pyne Cowley, Bożena Czerny, Wendy L. Freedman, Yilen Gómez Maqueo Chew, Gabriela González, Saeko S. Hayashi, Martha P. Haynes, Roberta M. Humphreys, Vicky Kalogera, Gillian Knapp, Shazrene S. Mohamed, Carole Mundell, Priyamvada Natarajan, Dara J. Norman, Hiranya Peiris, Judith Lynn Pipher, Dina Prialnik, Anneila I. Sargent, Sara Seager, Gražina Tautvaišienė,

Silvia Torres-Peimbert, Virginia Trimble, Meg Urry, Ewine F. van Dishoeck, Patricia Ann Whitelock, Sidney Wolff, and Rosemary F. G. Wyse.

Dispatches from Planet 3 Jun 27 2022 An award-winning science writer presents a captivating collection of cosmological essays for the armchair astronomer The galaxy, the multiverse, and the history of astronomy are explored in this engaging compilation of cosmological tales by multiple-award-winning science writer Marcia Bartusiak. In thirty-two concise and engrossing essays, the author provides a deeper understanding of the nature of the universe and those who strive to uncover its mysteries. Bartusiak shares the back stories for many momentous astronomical discoveries, including the contributions of such pioneers as Beatrice Tinsley, with her groundbreaking research in galactic evolution, and Jocelyn Bell Burnell, the scientist who first discovered radio pulsars. An endlessly fascinating collection that you can dip into in any order, these pieces will transport you to ancient Mars, when water flowed freely across its surface; to the collision of two black holes, a cosmological event that released fifty times more energy than was radiating from every star in the universe; and to the beginning of time itself.

Fundamentals Mar 13 2021 One of our great contemporary scientists reveals the ten profound insights that illuminate what everyone should know about the physical world In Fundamentals, Nobel laureate Frank Wilczek offers the reader a simple yet profound exploration of reality based on the deep revelations of modern science. With clarity and an infectious sense of joy, he guides us through the essential concepts that form our understanding of what the world is and how it works. Through these pages, we come to see our reality in a new way--bigger, fuller, and stranger than it looked before. Synthesizing basic questions, facts, and dazzling speculations, Wilczek investigates the ideas that form our

understanding of the universe: time, space, matter, energy, complexity, and complementarity. He excavates the history of fundamental science, exploring what we know and how we know it, while journeying to the horizons of the scientific world to give us a glimpse of what we may soon discover. Brilliant, lucid, and accessible, this celebration of human ingenuity and imagination will expand your world and your mind.

The Day We Found the Universe Nov 01 2022 The riveting and mesmerizing story behind a watershed period in human history, the discovery of the startling size and true nature of our universe. On New Years Day in 1925, a young Edwin Hubble released his finding that our Universe was far bigger, eventually measured as a thousand trillion times larger than previously believed. Hubble's proclamation sent shock waves through the scientific community. Six years later, in a series of meetings at Mount Wilson Observatory, Hubble and others convinced Albert Einstein that the Universe was not static but in fact expanding. Here Marcia Bartusiak reveals the key players, battles of will, clever insights, incredible technology, ground-breaking research, and wrong turns made by the early investigators of the heavens as they raced to uncover what many consider one of most significant discoveries in scientific history.

E = Einstein Jan 23 2022 Paying tribute to the founding father of the Theory of Relativity, this brilliant collection of 30 essays, presented by three prominent scientist/editors, explores the life, theories, and legacy of one of science's most legendary thinkers.

Einstein's Telescope: The Hunt for Dark Matter and Dark Energy in the Universe Oct 20 2021 "Splendidly satisfying reading, designed for a nonspecialist audience."—Kirkus Reviews, starred review Evalyn Gates, a talented astrophysicist, transports readers to the edge of contemporary science to explore the

revolutionary tool—"Einstein's telescope"—that is unlocking the secrets of the Universe. Einstein's telescope, or gravitational lensing, is so-called for the way gravity causes space to distort and allow massive objects to act like "lenses," amplifying and distorting the images of objects behind them. By allowing for the detection of mass where no light is found, scientists can map out the distribution of dark matter and come a step closer to teasing out the effects of dark energy on the Universe—which may forever upend long-held notions about where the Universe came from and where it is going.

Cosmic Odyssey Jun 03 2020 From newborn galaxies to icy worlds and blazing quasars, a behind-the-scenes story of how Palomar Observatory astronomers unveiled our complex universe. Ever since 1936, pioneering scientists at Palomar Observatory in Southern California have pushed against the boundaries of the known universe, making a series of dazzling discoveries that changed our view of the cosmos: quasars, colliding galaxies, supermassive black holes, brown dwarfs, supernovae, dark matter, the never-ending expansion of the universe, and much more. In Cosmic Odyssey, astronomer Linda Schweizer tells the story of the men and women at Palomar and their efforts to decipher the vast energies and mysterious processes that govern our universe. Palomar was the Apollo mission of its era. The first images from the 200-inch George Ellery Hale telescope, commissioned in 1948 as the world's largest, generated as much excitement as images from the moon in 1969 and from the Hubble Space Telescope more recently. So far, Palomar's "Big Eye" and three other telescopes have yielded more than 75,000 telescope-nights of precious data. Schweizer takes readers behind the scenes of scientific discovery, mapping the often chaotic process of detours, dead ends, and serendipitous leaps of insight. Although her focus is on Palomar, she follows threads of discovery across

the world to other teams and observatories. Based on more than one hundred interviews and enhanced by research in scientific journals, her account paints a fascinating picture of how discrete insights acquired over decades by researchers in a global community cascade, collide, and finally coalesce into the discoveries we come to accept as facts.

First Dawn Dec 22 2021 From the very first moments of the universe to the birth of the first star, our solar system, and our planet: a physicist traces the known and the unknown. Since the beginning of the twentieth century, the horizon of our knowledge about the universe has expanded to encompass the infinitesimally small—and the infinitely vast. In First Dawn, physicist Roberto Battiston takes readers on a journey through space and time, to the boundaries of our knowledge and beyond. From the violence of the Big Bang and the birth of the first star, hundreds of millions of years later, to the emergence of our solar system, the dawn of life on Earth, and the possibility of life on other planets, Battiston maps what we know about the universe and how we came to know it—cautioning us, however, that what we know is a minuscule fraction of what there is to know. Battiston outlines discoveries by some of the greatest theoretical physicists of the twentieth century, including Einstein, Bohr, Schrödinger, Heisenberg, Fermi, and Hubble; discusses the mysteries of dark energy and dark matter; and considers what it means for the universe to have emerged out of nothing. The ignition of the first star illuminated a universe that had been expanding, unobserved and unobservable, in the dark. Drawing on his own research, Battiston discusses the birth of the Sun, the formation of planets, the origins of life, interstellar migrations, extrasolar planets, black holes, gravitational waves, and much more. But, he warns, for some questions—the dimensions of the universe, for example, or the existence of other universes—we are destined to remain in

the realm of speculation.

Warped Passages Oct 27 2019 The universe has many secrets. It may hide additional dimensions of space other than the familier three we recognize. There might even be another universe adjacent to ours, invisible and unattainable . . . for now. Warped Passages is a brilliantly readable and altogether exhilarating journey that tracks the arc of discovery from early twentieth-century physics to the razor's edge of modern scientific theory. One of the world's leading theoretical physicists, Lisa Randall provides astonishing scientific possibilities that, until recently, were restricted to the realm of science fiction. Unraveling the twisted threads of the most current debates on relativity, quantum mechanics, and gravity, she explores some of the most fundamental questions posed by Nature—taking us into the warped, hidden dimensions underpinning the universe we live in, demystifying the science of the myriad worlds that may exist just beyond our own.

Stephen Hawking: An Unfettered Mind Jan 29 2020 In an updated edition with a new chapter, just in time for Stephen Hawking's 75th birthday, Kitty Ferguson looks at one of the most remarkable figures of our age—bestselling author of A Brief History of Time, celebrated theoretical physicist, and an inspiration to millions around the world -- with fresh insights into the way he thinks and works, his ever-more-imaginative adventures in science at the “flaming ramparts of the world,” the discovery of gravity waves, the blockbuster proposal for “Starshot” to explore the cosmos, and his increasingly powerful use of his celebrity on behalf of human rights and survival on earth and beyond. With rare access to Hawking, including childhood photos and in-depth research, award-winning author Kitty Ferguson continues to create a rich and comprehensive picture of Hawking's life: his childhood; the heartbreaking ALS diagnosis when he was a first-year graduate student; his long personal battle for survival in

pursuit of a scientific understanding of the universe; and his rise to international fame. Ferguson uses her gift for translating the language of theoretical physics into the language of the rest of us to make Hawking's scientific work accessible. This is an insightful, absorbing, and definitive account of a brilliant mind and the extraordinary life of a man who at seventy-five is as up-to-date as tomorrow.

Through a Universe Darkly Jul 29 2022 Explores the phenomenon of "dark matter," surveying speculation on this intriguing mystery throughout history and discussing contemporary theories

Coming of Age in the Milky Way May 27 2022 From the second-century celestial models of Ptolemy to modern-day research institutes and quantum theory, this classic book offers a breathtaking tour of astronomy and the brilliant, eccentric personalities who have shaped it. From the first time mankind had an inkling of the vast space that surrounds us, those who study the universe have had to struggle against political and religious preconceptions. They have included some of the most charismatic, courageous, and idiosyncratic thinkers of all time. In Coming of Age in the Milky Way, Timothy Ferris uses his unique blend of rigorous research and captivating narrative skill to draw us into the lives and minds of these extraordinary figures, creating a landmark work of scientific history.

Archives of the Universe Dec 10 2020 One hundred primary documents chronicle the history of astronomy, from early naked-eye celestial observation and cosmic mapping to the discovery of black holes, quasars, the Big Bang, and dark matter, in works by Copernicus, Galileo, Kepler, Newton, Halley, Hubble, Einstein, and other great scientists, all accompanied by authoritative commentary and explanations. 12,500 first printing.

Archives of the Universe Sep 30 2022 An unparalleled history of astronomy presented in

the words of the scientists who made the discoveries. Here are the writings of Copernicus, Galileo, Kepler, Newton, Halley, Hubble, and Einstein, as well as that of dozens of others who have significantly contributed to our picture of the universe. From Aristotle's proof that the Earth is round to the 1998 paper that posited an accelerating universe, this book contains 100 entries spanning the history of astronomy. Award-winning science writer Marcia Bartusiak provides enormously entertaining introductions, putting the material in context and explaining its place in the literature. Archives of the Universe is essential reading for professional astronomers, science history buffs, and backyard stargazers alike.

The Perfect Theory Apr 01 2020 “One of the best popular accounts of how Einstein and his followers have been trying to explain the universe for decades” (Kirkus Reviews, starred review). Physicists have been exploring, debating, and questioning the general theory of relativity ever since Albert Einstein first presented it in 1915. This has driven their work to unveil the universe’s surprising secrets even further, and many believe more wonders remain hidden within the theory’s tangle of equations, waiting to be exposed. In this sweeping narrative of science and culture, an astrophysicist brings general relativity to life through the story of the brilliant physicists, mathematicians, and astronomers who have taken up its challenge. For these scientists, the theory has been both a treasure trove and an enigma. Einstein’s theory, which explains the relationships among gravity, space, and time, is possibly the most perfect intellectual achievement of modern physics—yet studying it has always been a controversial endeavor. Relativists were the target of persecution in Hitler’s Germany, hounded in Stalin’s Russia, and disdained in 1950s America. Even today, PhD students are warned that specializing in general relativity will make them unemployable.

Still, general relativity has flourished, delivering key insights into our understanding of the origin of time and the evolution of all the stars and galaxies in the cosmos. Its adherents have revealed what lies at the farthest reaches of the universe, shed light on the smallest scales of existence, and explained how the fabric of reality emerges. Dark matter, dark energy, black holes, and string theory are all progeny of Einstein's theory. In the midst of a momentous transformation in modern physics, as scientists look farther and more clearly into space than ever before, The Perfect Theory exposes the greater relevance of general relativity, showing us where it started, where it has led—and where it can still take us.

First Light Apr 13 2021 First Light opens a window into a previously dark and secret time in our Universe's history – the time when the first starts were born.

Dante and the Early Astronomer Jan 11 2021 Explore the evolution of astronomy from Dante to Einstein, as seen through the eyes of trailblazing Victorian astronomer Mary Acworth Evershed In 1910, Mary Acworth Evershed (1867-1949) sat on a hill in southern India staring at the moon as she grappled with apparent mistakes in Dante's Divine Comedy. Was Dante's astronomy unintelligible? Or was he, for a man of his time and place, as insightful as one could be about the sky? As the twentieth century began, women who wished to become professional astronomers faced difficult cultural barriers, but Evershed joined the British Astronomical Association and, from an Indian observatory, became an experienced observer of sunspots, solar eclipses, and variable stars. From the perspective of one remarkable amateur astronomer, readers will see how ideas developed during Galileo's time evolved or were discarded in Newtonian conceptions of the cosmos and then recast in Einstein's theories. The result is a book about the history of science but also a poetic meditation on literature,

science, and the evolution of ideas.

Finding Our Place in the Universe Jun 15 2021 How a team of researchers, led by the author, discovered our home galaxy's location in the universe. You are here: on Earth, which is part of the solar system, which is in the Milky Way galaxy, which itself is within the extragalactic supercluster Laniakea. And how can we pinpoint our location so precisely? For twenty years, astrophysicist Hélène Courtois surfed the cosmos with international teams of researchers, working to map our local universe. In this book, Courtois describes this quest and the discovery of our home supercluster. Courtois explains that Laniakea (which means “immense heaven” in Hawaiian) is the largest galaxy structure known to which we belong; it is huge, almost too large to comprehend—about five hundred million light-years in diameter. It contains about 100,000 large galaxies like our own, and a million smaller ones. Writing accessibly for nonspecialists, Courtois describes the visualization and analysis that allowed her team to map such large structures of the universe. She highlights the work of individual researchers, including portraits of several exceptional women astrophysicists—presenting another side of astronomy. Key ideas are highlighted in text insets; illustrations accompany the main text. The French edition of this book was named the Best Astronomy Book of 2017 by the astronomy magazine Ciel et espace. For this MIT Press English-language edition, Courtois has added descriptions of discoveries made after Laniakea: the cosmic velocity web and the Dipole and Cold Spot repellers. An engaging account of one of the most important discoveries in astrophysics in recent years, her story is a tribute to teamwork and international collaboration.

Flashes of Creation Nov 28 2019 A respected physics professor and author breaks down the great debate over the Big Bang and the continuing quest to understand the fate of the

universe. Today, the Big Bang is so entrenched in our understanding of the cosmos that to doubt it would seem crazy. But as Paul Halpern shows in Flashes of Creation, just decades ago its mere mention caused sparks to fly. At the center of the debate were Russian American physicist George Gamow and British astrophysicist Fred Hoyle. Gamow insisted that a fiery explosion explained how the elements of the universe were created. Attacking the idea as half-baked, Hoyle countered that the universe was engaged in a never-ending process of creation. The battle was fierce. In the end, Gamow turned out to be right -- mostly -- and Hoyle, along with his many achievements, is remembered for giving the theory the silliest possible name: "The Big Bang." Halpern captures the brilliance of both thinkers and reminds us that even those proved wrong have much to teach us about boldness, imagination, and the universe itself.

Mapping the Heavens Feb 21 2022 A theoretical astrophysicist explores the ideas that transformed our knowledge of the universe over the past century. The cosmos, once understood as a stagnant place, filled with the ordinary, is now a universe that is expanding at an accelerating pace, propelled by dark energy and structured by dark matter. Priyamvada Natarajan, our guide to these ideas, is someone at the forefront of the research—an astrophysicist who literally creates maps of invisible matter in the universe. She not only explains for a wide audience the science behind these essential ideas but also provides an understanding of how radical scientific theories gain acceptance. The formation and growth of black holes, dark matter halos, the accelerating expansion of the universe, the echo of the big bang, the discovery of exoplanets, and the possibility of other universes—these are some of the puzzling cosmological topics of the early twenty-first century. Natarajan discusses why the acceptance of new ideas about the universe and our place in it has never been linear and

always contested even within the scientific community. And she affirms that, shifting and incomplete as science always must be, it offers the best path we have toward making sense of our wondrous, mysterious universe. “Part history, part science, all illuminating. If you want to understand the greatest ideas that shaped our current cosmic cartography, read this book.”—Adam G. Riess, Nobel Laureate in Physics, 2011 “A highly readable, insider’s view of recent discoveries in astronomy with unusual attention to the instruments used and the human drama of the scientists.”—Alan Lightman, author of The Accidental Universe and Einstein's Dream

Mind of God Mar 25 2022 A physicist uses science and philosophy to answer the ancient, unsolvable question: why does the universe exist?

Universe in Creation May 03 2020 We know the universe has a history, but does it also have a story of self-creation to tell? Yes, in Roy R. Gould’s account. He offers a compelling narrative of how the universe—with no instruction other than its own laws—evolved into billions of galaxies and gave rise to life, including humans who have been trying for millennia to comprehend it. Far from being a random accident, the universe is hard at work, extracting order from chaos. Making use of the best current science, Gould turns what many assume to be true about the universe on its head. The cosmos expands inward, not outward. Gravity can drive things apart, not merely together. And the universe seems to defy entropy as it becomes more ordered, rather than the other way around. Strangest of all, the universe is exquisitely hospitable to life, despite its being constructed from undistinguished atoms and a few unexceptional rules of behavior. Universe in Creation explores whether the emergence of life, rather than being a mere cosmic afterthought, may be written into the most basic laws of nature. Offering a fresh take on what brought the world—and us—into being,

Gould helps us see the universe as the master of its own creation, not tethered to a singular event but burgeoning as new space and energy continuously stream into existence. It is a very old story, as yet unfinished, with plotlines that twist and churn through infinite space and time.

Edwin Hubble Mar 01 2020 Edwin Hubble: Mariner of the Nebulae is both the biography of an extraordinary human being and the story of the greatest quest in the history of astronomy since the Copernican revolution. The book is a revealing portrait of scientific genius, an incisive engaging history of ideas, and a shimmering evocation of what we see when gazing at the stars. Born in 1889 and reared in the village of Marshfield, Missouri, Edwin Powell Hubble-star athlete, Rhodes Scholar, military officer, and astronomer- became one of the towering figures in twentieth-century science. Hubble worked with the great 100-inch Hooker telescope at California's Mount Wilson Observatory and made a series of discoveries that revolutionized humanity's vision of the cosmos. In 1923 he was able to confirm the existence of other nebulae (now known to be galaxies) beyond our own Milky Way. By the end of the decade, Hubble had proven that the universe is expanding, thus laying the very cornerstone of the big bang theory of creation. It was Hubble who developed the elegant scheme by which the galaxies are classified as ellipticals and spirals, and it was Hubble who first provided reliable evidence that the universe is homogeneous, the same in all directions as far as the telescope can see. An incurable Anglophile with a penchant for tweed jackets and English briars, Hubble, together with his brilliant and witty wife, Grace Burke, became a fixture in Hollywood society in the 1930s and 40s. They counted among their friends Charlie Chaplin, the Marx brothers, Anita Loos, Aldous and Maria Huxley, Walt Disney, Helen Hayes, and William Randolph Hearst. Albert Einstein, a frequent visitor to Southern California, called Hubble's work

"beautiful" and modified his equations on relativity to account for the discovery that the cosmos is expanding.

Through a Universe Darkly Feb 09 2021

The Realm of the Nebulae Oct 08 2020 No modern astronomer made a more profound contribution to our understanding of the cosmos than did Edwin Hubble, who first conclusively demonstrated that the universe is expanding. Basing his theory on the observation of the change in distanct galaxies, called red shift, Hubble showed that this is a Doppler effect, or alteration in the wavelength of light, resulting from the rapid motion of celestial objects away from Earth. In 1935, Hubble described his principal observations and conclusions in the Silliman lectures at Yale University. These lectures were published the following year as "The Realm of the Nebulae," which quickly became a classic work.

Secrets of the Universe Nov 08 2020 How did our universe come to exist? Why do stars shine? Is there life beyond the Earth? For millennia, humans have looked to the celestial sphere to explain the cosmos,first recording the movements of the Moon 25,000 years ago. Since the Enlightenmentand the dawn of the space age, scientists have been unravelling cosmic mysteries, andraising astonishing new questions for future generations to answer. Today we live inan age of unprecedented astronomical revelation, from the discovery of water on Marsto the detection of gravitational waves and the first photograph of a black hole. World-renowned astronomer Paul Murdin explains the science behind these discoveries, along with the passions, strugglesand quirks of fate that made them some of the most intriguing dramas of their times,demonstrating how human ingenuity and technological innovation have expandedour knowledge of the Universe beyond anything our ancestors even as recently asa generation ago could ever have imagined. ONIX short

Einstein's Unfinished Symphony Jul 25 2019 A

new generation of observatories, now being completed worldwide, will give astronomers not just a new window on the cosmos but a whole new sense with which to explore and experience the heavens above us. Instead of collecting light waves or radio waves, these novel instruments will allow astronomers to at last place their hands upon the fabric of space-time and feel the very rhythms of the universe. These vibrations in space-time-or gravity waves-are the last prediction of Einstein's general theory of relativity yet to be observed directly. They are his unfinished symphony, waiting nearly a century to be heard. When they finally reveal themselves to astronomers, we will for the first time be able to hear the cymbal crashes from exploding stars, tune in to the periodic drumbeats from swiftly rotating pulsars, listen to the extended chirps from the merger of two black holes, and eavesdrop on the remnant echoes from the mighty jolt of the Big Bang itself. When Einstein introduced general relativity in 1915, it was hailed as a momentous conceptual achievement. Einstein attained celebrity status. But, once scientists verified what they could of the theory, given the scant experiments available at the time, general relativity became "largely a theoretical curiosity," writes Marcia Bartusiak. Now, after decades of technological advancement, general relativity is being tested with unprecedented accuracy. It even affects our everyday lives. Satellites used by both travelers and soldiers to peg their positions require constant corrections of Einsteinian precision. Meanwhile, the first gravity-wave "telescopes"--Including the LIGO facility-are about to come alive.

Neutrino Hunters Jun 23 2019 The incredibly small bits of matter we call neutrinos may hold the secret to why antimatter is so rare, how mighty stars explode as supernovas and what the universe was like just seconds after the big bang. They even illuminate the inner workings of our own planet. For more than eighty years,

adventurous minds from around the world have been chasing these ghostly particles, trillions of which pass through our bodies every second. Extremely elusive and difficult to pin down, neutrinos are not unlike the brilliant and eccentric scientists who doggedly pursue them. Ray Jayawardhana recounts in Neutrino Hunters a captivating saga of scientific discovery and celebrates a glorious human quest, revealing why the next decade of neutrino hunting could redefine how we think about physics, cosmology and our lives on Earth.

Thursday's Universe Aug 30 2022 From the history of the science to the cutting edge of knowledge and technology, the story of modern astrophysics is told through interviews with and profiles of leading scientists and theoreticians.

What Stars Are Made Of May 15 2021 Cecilia Payne-Gaposchkin was the revolutionary scientific thinker who discovered what stars are made of. But her name is hard to find alongside those of Hubble, Herschel, and other great astronomers. Donovan Moore tells the story of Payne's life of determination against all the obstacles a patriarchal society erected against her.

Thursday's Universe Apr 25 2022 From the history of the science to the cutting edge of knowledge and technology, the story of modern astrophysics is told through interviews with and profiles of leading scientists and theoreticians

Frozen Star Sep 18 2021

Searching for the Oldest Stars Aug 25 2019 Astronomers study the oldest observable stars in the universe in much the same way that archaeologists study ancient artifacts on Earth. Here, Anna Frebel--who is credited with discovering several of the oldest and most primitive stars using the world's largest telescopes--takes readers into the far-flung depths of space and time to provide a gripping firsthand account of the cutting-edge science of stellar archaeology. Weaving the latest findings in astronomy with her own compelling insights

as one of the world's leading researchers in the field, Frebel explains how sections of the night sky are "excavated" in the hunt for these extremely rare relic stars--some of which have been shining for more than 13 billion years--and how this astonishing quest is revealing tantalizing new details about the earliest times in the universe.--

Near-Earth Objects Dec 30 2019 An insider's look at the science of near-Earth comets and asteroids Of all the natural disasters that could befall us, only an Earth impact by a large comet or asteroid has the potential to end civilization in a single blow. Yet these near-Earth objects also offer tantalizing clues to our solar system's origins, and someday could even serve as stepping-stones for space exploration. In this book, Donald Yeomans introduces readers to the science of near-Earth objects—its history, applications, and ongoing quest to find near-Earth objects before they find us. In its course around the sun, the Earth passes through a veritable shooting gallery of millions of nearby comets and asteroids. One such asteroid is thought to have plunged into our planet sixty-five million years ago, triggering a global catastrophe that killed off the dinosaurs. Yeomans provides an up-to-date and accessible guide for understanding the threats posed by near-Earth objects, and also explains how early collisions with them delivered the ingredients that made life on Earth possible. He shows how later impacts spurred evolution, allowing only the most adaptable species to thrive—in fact, we humans may owe our very existence to objects that struck our planet. Yeomans takes readers behind the scenes of today’s efforts to find, track, and study near-Earth objects. He shows how the same comets and asteroids most likely to collide with us could also be mined for precious natural resources like water and oxygen, and used as watering holes and fueling stations for expeditions to Mars and the outermost reaches of our solar system.

Wrinkles in Time Sep 06 2020 Astrophysicist George Smoot spent decades pursuing the origin of the cosmos, "the holy grail of science," a relentless hunt that led him from the rain forests of Brazil to the frozen wastes of Antarctica. In his search he struggled against time, the elements, and the forces of ignorance and bureaucratic insanity. Finally, after years of research, Smoot and his dedicated team of Berkeley researchers succeeded in proving the unprovable—uncovering, inarguably and for all time, the secrets of the creation of the universe. Wrinkles in Time describes this startling discovery that would usher in a new scientific age—and win Smoot the Nobel Prize in Physics.
Brilliant Blunders Aug 18 2021 "Drawing on the lives of five great scientists -- Charles Darwin, William Thomson (Lord Kelvin), Linus Pauling, Fred Hoyle and Albert Einstein -- scientist/author Mario Livio shows how even the greatest scientists made major mistakes and how science built on these errors to achieve breakthroughs, especially into the evolution of life and the universe"--
Ripples in Spacetime Jul 05 2020 A spacetime appetizer -- Relatively speaking -- Einstein on trial -- Wave talk and bar fights -- The lives of stars -- Clockwork precision -- Laser quest -- The path to perfection -- Creation stories -- Cold case -- Gotcha -- Black magic -- Nanoscience -- Follow-up questions -- Space invaders -- Surf's up for Einstein wave astronomy