

## Comet Carl Sagan

David Levy has held a lifelong passion for comets, and is one of the most successful comet discoverers in history. In this book he describes the observing techniques that have been developed over the years--from visual observations and searching, to photography, through to electronic charge-coupled devices (CCDs). He combines the history of comet hunting with the latest techniques, showing how our understanding of comets has evolved over time. This practical handbook is suitable for amateur astronomers, from those who are casually interested in comets and how to observe them, to those who want to begin and expand an observing program of their own. Drawing widely from his own extensive experience, Levy describes how enthusiastic amateurs can observe comets and try to make new discoveries themselves. David H. Levy is one of the world's foremost amateur astronomers. He has discovered seventeen comets, seven using a telescope in his own backyard, and had a minor planet, Asteroid 3673 Levy named in his honor. He is best known as the co-discoverer of the famous 1994 Shoemaker-Levy 9 comet. Levy is frequently interviewed in the media and succeeded Carl Sagan as science columnist for Parade magazine. He has written and contributed to a number of books, most recently David Levy's Guide to the Night Sky (Cambridge, 2001).

What are these graceful visitors to our skies? We now know that they bring both life and death and teach us about our origins. Comet begins with a breathtaking

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journey through space astride a comet. Pulitzer Prize-winning astronomer Carl Sagan, author of *Cosmos* and *Contact*, and writer Ann Druyan explore the origin, nature, and future of comets, and the exotic myths and portents attached to them. The authors show how comets have spurred some of the great discoveries in the history of science and raise intriguing questions about these brilliant visitors from the interstellar dark. Were the fates of the dinosaurs and the origins of humans tied to the wanderings of a comet? Are comets the building blocks from which worlds are formed? Lavishly illustrated with photographs and specially commissioned full-color paintings, *Comet* is an enthralling adventure, indispensable for anyone who has ever gazed up at the heavens and wondered why. Praise for *Comet* "Simply the best." —*The Times of London* "Fascinating, evocative, inspiring." —*The Washington Post* "Comet humanizes science. A beautiful, interesting book." —*United Press International* "Masterful . . . science, poetry, and imagination." —*The Atlanta Journal & Constitution*

Explores how comets, meteors, and asteroids move through our solar system, and explains the ingredients that make a comet's tail and other topics

Taking its cue from "The Dragons of Eden," Carl Sagan's 1977 bestselling classic, "Up from Dragons" traces the development of human intelligence back to its animal roots in an attempt to account for the vast differences between our species and all those that came before us.

"This special edition consists of 750 unsigned numbered

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copies, and 52 lettered copies signed by the author" 'A promising debut.' New Scientist Icy, rocky, sometimes dusty, always mysterious – comets and asteroids are among the Solar System's very oldest inhabitants, formed within a swirling cloud of gas and dust in the area of space that eventually hosted the Sun and its planets. Locked within each of these extra-terrestrial objects is the 4.6-billion-year wisdom of Solar System events, and by studying them at close quarters using spacecraft we can coerce them into revealing their closely-guarded secrets. This offers us the chance to answer some fundamental questions about our planet and its inhabitants. Exploring comets and asteroids also allows us to shape the story of Earth's future, enabling us to protect our precious planet from the threat of a catastrophic impact from space, and maybe to even recover valuable raw materials from them. This cosmic bounty could be as useful in space as it is on Earth, providing the necessary fuel and supplies for humans as they voyage into deep space to explore more distant locations within the Solar System. Catching Stardust tells the story of these enigmatic celestial objects, revealing how scientists are using them to help understand a crucial time in our history – the birth of the Solar System, and everything contained within it.

Felix is an enthusiastic kid who loves his dog Cosmo, school, and two best friends, until the November day Dave Spangler moves to town. Spangler gives him a horrible nickname, and Felix begins to doubt everything. On Thanksgiving night, he walks his dog, looks up in the sky, and notices something that takes the roller coaster

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ride of the week back up again. However, Spangler isn't through with him yet. Tai and Kelsey have his back, and so do a lot of others, even if he doesn't know it. He tries to handle everything by himself, especially being picked on, because being called a name really can't be that bad, can it? The last thing he wants to do is tattle.

Presents a realistic, workable plan for defusing a potentially lethal threat from a rogue asteroid or comet. The explosion of a large meteor over Chelyabinsk, Siberia, in February 2013 is just the latest reminder that planet Earth is vulnerable to damaging and potentially catastrophic collisions with space debris of various kinds. In this informative and forward-looking book, veteran aerospace writer William E. Burrows explains what we can do in the future to avoid far more serious impacts from "Near-Earth Objects" (NEOs), as they are called in the planetary defense community. The good news is that humanity is now equipped with the advanced technology necessary to devise a long-term strategy to protect the planet. Burrows outlines the following key features of an effective planetary defense strategy:

- \* A powerful space surveillance system capable of spotting a serious threat from space at least twenty-five years in advance
- \* A space craft "nudge" that would throw a collision-course asteroid off target long before it poses the threat of imminent impact
- \* A weapons system to be used as a last-ditch method to blast an NEO should all else fail.

The author notes the many benefits for world stability and increasing international cooperation resulting from a united worldwide effort to protect the planet. Combining realism with an optimistic can-do attitude, Burrows

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shows that humanity is capable of overcoming a potentially calamitous situation.

Presents an introduction to the Solar System and the physical features of the eight planets that revolve around the Sun, in a text that includes learning activities.

A classic book by the world's most famous scientist and science visionary, back in print with a new perspective.

This sequel to Carl Sagan's blockbuster continues the electrifying journey through space and time, connecting with worlds billions of miles away and envisioning a future of science tempered with wisdom. Based on National Geographic's internationally-renowned television series, this groundbreaking and visually stunning book explores how science and civilization grew up together. From the emergence of life at deep-sea vents to solar-powered starships sailing through the galaxy, from the Big Bang to the intricacies of intelligence in many life forms, acclaimed author Ann Druyan documents where humanity has been and where it is going, using her unique gift of bringing complex scientific concepts to life. With evocative photographs and vivid illustrations, she recounts momentous discoveries, from the Voyager missions in which she and her husband, Carl Sagan, participated to Cassini-Huygens's recent insights into Saturn's moons. This breathtaking sequel to Sagan's masterpiece explains how we humans can glean a new understanding of consciousness here on Earth and out in the cosmos--again reminding us that our planet is a pale blue dot in an immense universe of possibility.

“Ann Druyan has unearthed a treasure. It is a treasure of reason, compassion, and scientific awe. It should be the next book you read.” —Sam Harris, author of *The End of Faith* “A stunningly valuable legacy left to all of us by a great human being. I miss him so.” —Kurt Vonnegut Carl Sagan's prophetic

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vision of the tragic resurgence of fundamentalism and the hope-filled potential of the next great development in human spirituality The late great astronomer and astrophysicist describes his personal search to understand the nature of the sacred in the vastness of the cosmos. Exhibiting a breadth of intellect nothing short of astounding, Sagan presents his views on a wide range of topics, including the likelihood of intelligent life on other planets, creationism and so-called intelligent design, and a new concept of science as "informed worship." Originally presented at the centennial celebration of the famous Gifford Lectures in Scotland in 1985 but never published, this book offers a unique encounter with one of the most remarkable minds of the twentieth century.

It's 1986 and Halley's Comet is hurtling towards Earth. Everyone is talking about what the comet will bring - wishes could be granted, people might go mad, great disasters could happen... When Andrew is asked to write down his greatest wish for the Comet Box, he can think of only one thing – that his runaway sister Amelia will finally come home. As the comet draws nearer he begins to learn the reasons why she left in the first place and the more he learns, the more he wants to forget. When Amelia is captured and brought home she reveals a shocking secret that makes Andrew's once safe world begin to unravel. As the comet arrives, Andrew must choose whether to be blind to the mistakes of the people around him or to side with his sister as she tears his family apart.

Have you ever seen a comet? It is a marvelous experience, one that all humans can share, that spawns a deep yearning to understand the spectacle. Have you ever wondered what comets are and why astronomers spend so much time studying them? Now, a comet expert and an astronomical historian have come together to produce the unique book that you now hold in your hands. Using their several decades of

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teaching experience, the authors have concisely presented the information you need to comprehend these majestic apparitions that grace our night skies. No mathematical proficiency is needed, in fact, this book doesn't contain a single equation! Comets are cosmic Rosetta stones, bridging our current knowledge by digging back to the earliest days of our Solar Systems. How did life arise on Earth? Did comets play a significant role in bringing water and the necessary organic matter to our early Earth? How about the dinosaurs? Were they driven to extinction by a cometary impact 66 million years ago? Comets may be both the enablers and destroyers of life on Earth as we know it. These are some of the tantalizing questions discussed here. If you so desire, steps are given to join the ranks of amateur comet hunters. Astronomy is one of the last sciences where amateurs play a significant role. Your reward for discovery? A comet officially bearing your name in the history books! The next Great Comet is on its way, we just do not know when it will arrive. Armed with this book, you will be ready to enjoy this unforgettable event.

'Incoming Asteroid!' is based on a project within ASTRA (the Association in Scotland to Research into Astronautics) to provide scientific answers to the question – what would we do if we knew there was going to be an asteroid impact in ten years' time or less? Clearly there are many things humanity can do nothing about, for example an unseen object traveling towards us so fast that we have no time to prepare, or an object so large it may be unstoppable. A realistic hazard model was decided upon, and the scenario developed from that: an incoming object about 1 kilometer in diameter, in an orbit ranging from the outer rim of the Asteroid Belt to within that of Earth's. Three basic possibilities are considered in this book. The first is the deflection of the asteroid, using remote probes along with a number of possible technologies

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to change the asteroid's course. Second is the attempt of a manned mission, in order to plant a propulsion system on the asteroid to push it into a different orbit. Third is the nuclear option, a last-ditch attempt to break up and then disperse the asteroid using nuclear weapons. (A rather impractical combination of these second and third options were used as the plot of the popular 1998 Bruce Willis feature film, *Armageddon*.) Although the cost of developing the technology needed to protect the Earth would be substantial, there would certainly be spin-off benefits. These could eventually result in practical small-scale atomic energy sources, new propulsion systems that could make extraterrestrial mining within the solar system a possibility, and other as-yet unforeseen benefits. And finally, *Incoming Asteroid!* considers the political implications - how governments across the world should best react to the threat with a view to minimizing loss of life, and in the weeks running up to the possible impact, preventing panic in the population.

The late author of such best-sellers as *Cosmos* examines humankind's changing awareness of its place in the universe and the rich potential of human ventures into the world beyond Earth. Reprint.

A fascinating book on the joys of discovering how the world works, by the Pulitzer Prize-winning author of *Cosmos* and *Shadows of Forgotten Ancestors*. "Magnificent . . . Delightful . . . A masterpiece. A message of tremendous hope for humanity . . . While ever conscious that human folly can terminate man's march into the future, Sagan nonetheless paints for us a mind-boggling future: intelligent robots, the discovery of extraterrestrial life and its consequences, and above all the challenge and pursuit of the mystery of the universe."—Chicago Tribune "Go out and buy this book, because Carl Sagan is not only one of the world's most respected scientists, he's a great writer. . . . I can give a book

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no greater accolade than to say I'm planning on reading it again. And again. And again."—The Miami Herald "The brilliant astronomer . . . is persuasive, provocative and readable."—United Press International "Closely reasoned, impeccably researched, gently humorous, utterly devastating."—The Washington Post

Pulitzer Prize-winning author and astronomer Carl Sagan imagines the greatest adventure of all—the discovery of an advanced civilization in the depths of space. In December of 1999, a multinational team journeys out to the stars, to the most awesome encounter in human history. Who—or what—is out there? In *Cosmos*, Carl Sagan explained the universe. In *Contact*, he predicts its future—and our own.

Fourteen-year-old Alan Broussard is swept up in his science teacher father's community-wide comet-watching activities, which illuminate for the young teen his father's inadequacies, his mother's unhappiness, and his own loss of innocence. A penetrating, mesmerizing biography of a scientific icon, now in paperback "Absolutely fascinating . . . Davidson has done a remarkable job."-Sir Arthur C. Clarke "Engaging . . . accessible, carefully documented . . . sophisticated."-Dr. David Hollinger for The New York Times Book Review "Entertaining . . . Davidson treats [the] nuances of Sagan's complex life with understanding and sympathy."-The Christian Science Monitor "Excellent . . . Davidson acts as a keen critic to Sagan's works and their vast uncertainties."-Scientific American "A fascinating book about an extraordinary man."-Johnny Carson "Davidson, an award-winning science writer, has written an absorbing portrait of this Pied Piper of planetary science. Davidson thoroughly explores Sagan's science, wrestles with his politics, and plumbs his personal passions with a telling instinct for the revealing underside of a life lived so publicly."-Los Angeles Times Carl Sagan was one of the most celebrated scientists of this century-the

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handsome and alluring visionary who inspired a generation to look to the heavens and beyond. His life was both an intellectual feast and an emotional rollercoaster. Based on interviews with Sagan's family and friends, including his widow, Ann Druyan; his first wife, acclaimed scientist Lynn Margulis; and his three sons, as well as exclusive access to many personal papers, this highly acclaimed life story offers remarkable insight into one of the most influential, provocative, and beloved figures of our time—a complex, contradictory prophet of the Space Age.

Presents an illustrated guide to the universe and to Earth's relationship to it, moving from theories of creation to humankind's discovery of the cosmos, to general relativity, to space missions, and beyond.

**INSTANT NEW YORK TIMES BESTSELLER** “Provocative and thrilling ... Loeb asks us to think big and to expect the unexpected.” —Alan Lightman, New York Times bestselling author of *Einstein’s Dreams* and *Searching for Stars on an Island in Maine* Harvard’s top astronomer lays out his controversial theory that our solar system was recently visited by advanced alien technology from a distant star. In late 2017, scientists at a Hawaiian observatory glimpsed an object soaring through our inner solar system, moving so quickly that it could only have come from another star. Avi Loeb, Harvard’s top astronomer, showed it was not an asteroid; it was moving too fast along a strange orbit, and left no trail of gas or debris in its wake. There was only one conceivable explanation: the object was a piece of advanced technology created by a distant alien civilization. In *Extraterrestrial*, Loeb takes readers inside the thrilling story of the first interstellar visitor to be spotted in our solar system. He outlines his controversial theory and its profound implications: for science, for religion, and for the future of our species and our planet. A mind-bending journey through the furthest reaches of

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science, space-time, and the human imagination, Extraterrestrial challenges readers to aim for the stars—and to think critically about what's out there, no matter how strange it seems.

Omega, written by astronomer Camille Flammarion (1842?1925), is no less than an epic history of our future—a startling and unforgettable vision of the end of the world. Reasoned scientific speculation combined with probing philosophical inquiry lend credibility and magnitude to this tale of how humankind will physically and culturally evolve over the next several million years. ø The end begins in the twenty-fifth century, when a comet threatens to collide with the earth. The consequences of that frightening cosmic event are far-reaching, setting in motion a series of physical, psychic, and social changes that will profoundly affect the planet and its people far into the future. The earth's surface drastically transforms over time. Cultures radically alter, collapse, and fade away. Nations rise and fall, species become extinct, and human beings find themselves at the end of the world, alone and changed in fundamental ways. This melancholic, poetic science fiction tale of things to come is as compelling and disturbing today as when it was first written.

'Bursts with gloriously geeky detail.' The Telegraph Have you ever made someone you love a mix-tape? Forty years ago, a group of scientists, artists and writers gathered in a house in Ithaca, New York to work on the most important compilation ever conceived. It wasn't from one person to another, it was from Earth to the Cosmos. In 1977 NASA sent Voyager 1 and 2 on a Grand Tour of the outer planets. During the design phase of the Voyager mission, it was realised that this pair of plucky probes would eventually leave our solar system to drift forever in the unimaginable void of interstellar space. With this gloomy-sounding outcome in mind, NASA decided to do something optimistic. They commissioned astronomer Carl

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Sagan to create a message to be fixed to the side of Voyager 1 and 2 – a plaque, a calling card, a handshake to any passing alien that might one day chance upon them. The result was the Voyager Golden Record, a genre-hopping multimedia metal LP. A 90-minute playlist of music from across the globe, a sound essay of life on Earth, spoken greetings in multiple languages and more than 100 photographs and diagrams, all painstakingly chosen by Sagan and his team to create an aliens' guide to Earthlings. The record included music by J.S. Bach and Chuck Berry, a message of peace from US president Jimmy Carter, facts, figures and dimensions, all encased in a golden box. The Vinyl Frontier tells the story of NASA's interstellar mix-tape, from first phone call to final launch, when Voyager 1 and 2 left our planet bearing their hopeful message from the Summer of '77 to a distant future.

For readers of Station Eleven and Good Morning, Midnight comes an electric, heart-pounding novel of love and sacrifice that follows people around the world as they unite to prevent a global catastrophe. When dark comet UD3 was spotted near Jupiter's orbit, its existence was largely ignored. But to individuals who knew better--scientists like Benjamin Schwartz, manager of NASA's Center for Near-Earth Object Studies--the threat this eight-kilometer comet posed to the survival of the human race was unthinkable. The 150-million-year reign of the dinosaurs ended when an asteroid impact generated more than a billiontimes the energy of an atomic bomb. What would happen to Earth's seven billion inhabitants if a similar event were allowed to occur? Ben and his indomitable girlfriend Amy Kowalski fly to South America to assemble an international

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counteraction team, whose notable recruits include Love Mwangi, a UN interpreter and nomad scholar, and Zhen Liu, an extraordinary engineer from China's national space agency. At the same time, on board a polar icebreaker life continues under the looming shadow of comet UD3. Jack Campbell, a photographer for National Geographic, works to capture the beauty of the Arctic before it is gone forever. Gustavo Wayãpi, a Nobel Laureate poet from Brazil, struggles to accept the recent murder of his beloved twin brother. And Maya Gutiérrez, an impassioned marine biologist is--quite unexpectedly--falling in love for the first time. Together, these men and women must fight to survive in an unknown future with no rules and nothing to be taken for granted. They have two choices: neutralize the greatest threat the world has ever seen (preferably before mass hysteria hits or world leaders declare World War III) or come to terms with the annihilation of humanity itself. Their mission is codenamed The Effort. Includes a ReadingGroup Guide.

The well-known astronomer and astrobiologist surveys current knowledge of the development of intelligence on Earth in various forms of life and explains his persuasion that intelligence must have developed along similar lines throughout the universe

Join David J. Eicher in this fast-paced and entertaining journey through the history, present, and future of these important yet mysterious cosmic bodies. From ancient times, humans have been fascinated by 'broom stars' and 'blazing scimitars' lighting up the sky and moving against the fixed background of stars. The Great Comets

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of our time still receive in-depth attention - ISON, Hale-Bopp, Hyakutake, West, and others - while recent spacecraft encounters offer amazing insight into the earliest days of the solar system. In this guide you will discover the cutting-edge science of what comets are, how they behave, where they reside, how groups of comets are related, and much more. The author carefully explores the ideas relating comets and life on Earth - and the danger posed by impacts. He finishes with practical, how-to techniques, tips, and tricks on how to successfully observe comets and even to capture your own images of them.

Comet is a complete overview of the history of mankind's relationship with these visitors from deep space and a scientific exploration of their origins, nature and future "Fascinating . . . memorable . . . revealing . . . perhaps the best of Carl Sagan's books."—The Washington Post Book World (front page review) In *Cosmos*, the late astronomer Carl Sagan cast his gaze over the magnificent mystery of the Universe and made it accessible to millions of people around the world. Now in this stunning sequel, Carl Sagan completes his revolutionary journey through space and time. Future generations will look back on our epoch as the time when the human race finally broke into a radically new frontier—space. In *Pale Blue Dot*, Sagan traces the spellbinding history of our launch into the cosmos and assesses the future that looms before us as we move out into our own solar system and on to distant galaxies beyond. The exploration and eventual settlement of other worlds is neither a fantasy nor luxury, insists Sagan, but

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rather a necessary condition for the survival of the human race. "Takes readers far beyond Cosmos . . . Sagan sees humanity's future in the stars."—Chicago Tribune

About this book... Since the publication of *Worlds in Collision*, Dr. Immanuel Velikovsky's unconventional theories of the origin of the solar system have generated immense interest and bitter controversy. Chief among his critics has been the well-known astronomer, author and television personality, Dr. Carl Sagan, of Cornell University. While brilliantly defending Velikovsky's work, Carl Sagan and Immanuel Velikovsky mercilessly dissects Sagan, his blatantly snide, dishonest and unprofessional 'arguments,' and exposes the sordid and unscientific side of 'scientific' controversy.

NATIONAL BESTSELLER • "Exciting and provocative . . . A tour de force of a book that begs to be seen as well as to be read."—The Washington Post Book World  
World renowned scientist Carl Sagan and acclaimed author Ann Druyan have written a *Roots for the human species*, a lucid and riveting account of how humans got to be the way we are. *Shadows of Forgotten Ancestors* is a thrilling saga that starts with the origin of the Earth. It shows with humor and drama that many of our key traits—self-awareness, technology, family ties, submission to authority, hatred for those a little different from ourselves, reason, and ethics—are rooted in the deep past, and illuminated by our kinship with other animals. Sagan and Druyan conduct a breathtaking journey through space and time, zeroing in on critical turning points in evolutionary history, and tracing the

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origins of sex, altruism, violence, rape, and dominance. Their book culminates in a stunningly original examination of the connection between primate and human traits. Astonishing in its scope, brilliant in its insights, and an absolutely compelling read, *Shadows of Forgotten Ancestors* is a triumph of popular science. A prescient warning of a future we now inhabit, where fake news stories and Internet conspiracy theories play to a disaffected American populace “A glorious book . . . A spirited defense of science . . . From the first page to the last, this book is a manifesto for clear thought.”—Los Angeles Times

How can we make intelligent decisions about our increasingly technology-driven lives if we don’t understand the difference between the myths of pseudoscience and the testable hypotheses of science? Pulitzer Prize-winning author and distinguished astronomer Carl Sagan argues that scientific thinking is critical not only to the pursuit of truth but to the very well-being of our democratic institutions. Casting a wide net through history and culture, Sagan examines and authoritatively debunks such celebrated fallacies of the past as witchcraft, faith healing, demons, and UFOs. And yet, disturbingly, in today’s so-called information age, pseudoscience is burgeoning with stories of alien abduction, channeling past lives, and communal hallucinations commanding growing attention and respect. As Sagan demonstrates with lucid eloquence, the siren song of unreason is not just a cultural wrong turn but a dangerous plunge into darkness that threatens our most basic freedoms. Praise for *The Demon-Haunted World* “Powerful . . . A stirring defense of

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informed rationality. . . Rich in surprising information and beautiful writing.”—The Washington Post Book World  
“Compelling.”—USA Today “A clear vision of what good science means and why it makes a difference. . . . A testimonial to the power of science and a warning of the dangers of unrestrained credulity.”—The Sciences  
“Passionate.”—San Francisco Examiner-Chronicle  
Offers a tribute to the late scientist, with technical papers and popular essays from prominent scientists on such issues as religion and science, science education, and space science

CometBallantine Books

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-

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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.

Documents the history of Halley's Comet and describes, in two hundred photographs and an informative text, the path of the comet and the astronomical details of its existence

In 1977, two extraordinary spacecraft called Voyager were launched to the stars. Affixed to each Voyager craft was a gold-coated copped phonograph record as a message to possible extra-terrestrial civilizations that might encounter the spacecraft in some distant space and time. Each record contained 118 photographs of our planet; almost 90 minutes of the world's greatest music; an evolutionary audio essay on "The Sounds of Earth"; and greetings in almost sixty human languages (and one whale language). This book is an account, written by those

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chiefly responsible for the contents of the Voyager Record, of why they did it, how they selected the repertoire, and precisely what the record contains.

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