SAMPLE

Famous Astronomers: Carolyn Shoemaker

Comet Hunter

Aira Astralis

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Conclusion

This free sample contains the Introduction and Chapter 1. The complete book contains the full contents above.

Introduction

The most successful comet hunter in history began her career at fifty-one, with a teaching credential, three degrees in the humanities, and no formal training in astronomy at all. Carolyn Shoemaker, who found more comets than any observer alive or dead, came to the telescopes late and on her own terms: as a research assistant to her husband, the geologist Eugene Shoemaker, in the comet and asteroid survey he was running at Palomar Mountain. Within a decade she held the record for comet discoveries by an individual, a record she carried to the end of her long working life, and one of the comets she found, Shoemaker-Levy 9, became the most famous in the sky when its pieces crashed into Jupiter in the summer of 1994, in the first planetary impact ever witnessed by the watching world.

Her story is therefore not the usual one of the prodigy or the institution. She was born in New Mexico in 1929, raised in Southern California, educated in political science, history, and literature, and married at twenty-two to a young geologist who was about to spend his own career founding a science, the geology of other worlds. For a quarter-century she taught, raised a family, and moved through the background of her husband's remarkable life; when she stepped to the front, in 1980, it was by a sideways door, a job scanning photographic films for the moving points of light that turned out, again and again, to be comets.

The films were taken at Palomar Observatory, on wide-field Schmidt telescopes that photographed the sky in pairs, weeks apart; the scanning was done with a stereomicroscope, the paired films giving the viewer a three-dimensional view of the star field in which anything that moved, an asteroid, a comet, jumped out of the depth of the scene. She proved to have one of the greatest eyes in the history of the trade, and the trade, in its long twilight before the automated surveys, had never needed an eye more.

The numbers of her career, most of them compiled at that microscope, are of the kind the astronomy of a century of automation has not yet surpassed. Thirty-two comets carry her name as a discoverer, and hundreds upon hundreds of asteroids, over eight hundred by the standard counts, most of them found in the Palomar films over two decades of observing runs. Her most consequential find came in March 1993, with her husband and the amateur astronomer David Levy: a comet, broken into a chain of pieces, that proved to be orbiting Jupiter, and that would, sixteen months later, hit the planet before the eyes of every telescope on Earth. The impact of Shoemaker-Levy 9 was the astronomical event of the century's last decade, and it confirmed, in fireballs the size of the Earth, what the comet-hunting families of the world had been

saying all along: that comets and asteroids still strike the planets, and that the sky's quiet is not a guarantee.

A note on the sources and the shape of the record, before the story starts. Carolyn Shoemaker lived into the era of the extended interview, and her career is documented in her own words: the long oral histories and profiles of the 1990s and 2000s, the documentary record of the Shoemaker-Levy 9 weeks, and the biographical files of the agencies she served, the Geological Survey and the space agency, are generous, and the account in this book is built on them and on the catalogs. The counts quoted here, thirty-two comets and over eight hundred asteroids, are the standard figures of the discovery credit, and the reader who checks them against the catalogs will find the same numbers, with the small print that all such tallies carry, the credit conventions, the co-discoverers, the occasional object whose status the comets' own small bodies revise. The story itself needs no inflation: the record is the record, the impact is the impact, and the life, told plainly, is one of the science's best.

The chapters that follow keep one figure before the reader, and it is the film pair, the unit of the whole career. Everything in the story passed through it: the telescope's night of work, the scanner's day of judgment, the candidate's confirmation, and the catalog's entry, all of it one film pair at a time, thousands of pairs over twenty years. The figure is the career's clock and its currency, and the reader who holds it can follow every part of what follows, from the first run of 1980 to the comet that ended on Jupiter, in the same unit the work itself was done in.

This book tells her story in full: the New Mexico girlhood and the California schooling, the marriage into the first family of planetary geology, the late start and the apprenticeship at the microscope, the comets, the record, and the great discovery of 1993. It sets her in the context of her age, the last generation of human hunters and the first generation of impact-aware astronomy, and it follows the meaning of her work into the present, when the surveys she helped inspire sweep the sky without sleeping and the count of known near-Earth objects runs to the tens of thousands. She was a wife, a mother, a schoolteacher, and the greatest finder of comets there has ever been, and the parts of that sentence, in her life, never once contradicted each other.

Chapter 1: The Discovery of Carolyn Shoemaker

The record of her early life is the record of an ordinary American mid-century girlhood, and it matters precisely because of that. Carolyn Jean Spellmann was born on June 17, 1929, in Gallup, New Mexico, the daughter of a homemaker and an oil-field engineer who drilled water wells and pipelines; the family, chasing the father's work, moved in her childhood from New Mexico to Los Angeles and then to the ranching town of Chino, California, and she grew up as the sister of an older brother, Richard, who would himself become, years later, a professional astronomer. The household was a reading household, and the child who read it all, history above all, showed no particular bent toward the sky. The sky of her girlhood was the dark desert sky of the Southwest, but her recollections of it, told in her old age, are of a place and a wonder rather than a career: the stars were there, and no one in her family yet worked among them.

Her education was in the humanities. She took a bachelor's degree at Chico State College in California, in political science and history, a master's degree in the same field, and further graduate work in English literature and literature, at the University of California and at Chico again, and her professional plan, through her twenties, was teaching, history and English at the secondary level, and possibly college. She taught school briefly, wrote and edited, and by her own account enjoyed the life of the mind she had chosen. Astronomy was nowhere in it. The irony that the future's most productive comet hunter was educated in the century of the humanities is part of her story's charm, and the disciplines of her training, she said herself, were not wasted at the telescope: reading history taught her to read documents, and reading literature taught her to see.

The turn of her life came through a family connection. Her brother Richard, then working toward his own career in astronomy, had a fellow graduate student at the California Institute of Technology, a young geologist named Eugene Shoemaker, who was writing the doctoral work that would found the study of impact craters and, in time, the geology of the Moon. The young people met, and the meeting was decisive: Carolyn Spellmann and Gene Shoemaker married in August 1951, and the marriage, in the event, was to a man and to a science at once. She had married, as she liked to say, the man she loved, and the man she loved spent his life with his eyes on other worlds; the next quarter-century of her own life, though, was the classic one of the scientific household of the era, the moves, the children, the editing of her husband's papers, the long stretches as the sustaining center while the

volcanoes of the profession erupted around her.

The discovery of her aptitude, which is a part of the discovery of the person, deserves its own paragraph, because it happened in the pattern of all her best luck: quietly, inside work she was already doing. The scanning craft is learned in weeks, but its upper levels are reached by few, and the team's first seasons at Palomar were the audition: the films came in pairs, the scanner sat down, and the yield told the story. Her early discovery rate, in the first years of the survey, was high and climbing; her false-candidate rate was low and falling; and by the middle years of the 1980s the trade's numbers were saying what her husband had suspected and the catalogs would confirm, that the survey's assistant was the survey's engine.

The discovery of Carolyn Shoemaker, in the sense this chapter has meant, was therefore complete by the middle of the 1980s: the profession had found that a person of no astronomical training, hired at fifty-one to do a humble technical job, was one of the great observers of the age, and the finding had been made, in the way the science makes such findings, by the evidence of the finds themselves.

One more thread of the early life deserves its record, because the biographies keep it and it rounds the picture: the family she raised. She and Gene had three children, and the household, through the decades of the astrogeology branch's growth, was a working scientist's home in motion, the moves between the West's astronomical towns, the field seasons in the crater country, and the long collaborations of the survey era shared with the children in the back seat. The record matters for the shape of the career, because the family's existence, in the era's own conventions, was the work's precondition: the twenty years of Palomar runs were taken on a schedule that a household made possible, and the career that the science remembers was built, logistically, by the same marriage that built the family.

Her formal entry into astronomy waited until 1980, and it came in at the ground floor. Gene Shoemaker, by then the founder and chief of American planetary geology, was running a photographic survey for comets and asteroids at Palomar Observatory, using the historic 18-inch Schmidt telescope that had surveyed the northern sky decades before, and he needed a research assistant: someone to operate the telescope on the observing runs, to handle and file the films, and, most of all, to scan the film pairs, under the stereomicroscope, for the moving points of light that meant a comet or an asteroid.

He offered the job to his wife. She took it, at fifty-one, with the stated ambition, as she recalled it, of finding a comet for the joy of the thing, and the

joy, in the event, was compounded with interest: within a few years she had found dozens, and the ordinary girlhood of Gallup, New Mexico, had turned, by way of Chico and a marriage, into the most productive comet-finding career in the history of the subject.

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ABOUT THE AUTHOR

Aira Astralis is a science writer specializing in astronomy and space exploration. Her work spans the full breadth of humanity's relationship with the cosmos -- from the earliest naked-eye observations to the engineering marvels of modern space missions.

Her books are built on a foundation of primary sources: peer-reviewed research, mission archives, and direct engagement with the scientific community. She writes for readers who want to understand not just what we know about the universe, but how we came to know it.

She believes that the most important frontier is not out there but in the gap between what scientists discover and what the public understands. Her books exist to close that gap.