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Famous Astronomers: Eleanor Helin

Asteroid Discoverer

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

Most people who look at the night sky see stillness, and the sky forgives them for it. The planets shift from week to week, the Moon keeps its rounds, and the stars themselves seem fixed for a lifetime. But the space near the Earth is a crossing yard, swept by rocky travelers whose visits are brief, whose passes are close, and whose arrivals, in the deep past, have rearranged the history of life. One astronomer did more than almost anyone to chart that traffic. Her name was Eleanor Helin, her friends called her Glo, and for more than three decades she stood on the threshold of the telescope and the computer, counting the neighbors.

Her tally reads like a small census. Nine hundred asteroids and counting carry her name on the discovery credit, a figure no other individual woman approached in her generation, and a handful of comets whose designations still carry her name. Among the asteroids are some of the most consequential objects ever found: the first of the Atens, a class whose members orbit mostly inside the Earth's own path; an Apollo body that turned out to be a comet wearing an asteroid's mask; and a strange, near-star-grazing wanderer that forced the textbooks to widen a category. She built and led the two programs that found them, first a photographic search that ran on glass plates and patience, then an electronic survey that ran on sensors and software and very little sleep for anyone.

This book is about that career, and it is written for the general reader curious about both what she found and how it felt to find it. The how is a story of technology in transition. When Helin began her search in the early 1970s, asteroid discovery meant photographic plates, a blink comparator, and an eye trained over years to notice one short streak among thousands of star images. When her second program ended in 2007, discovery meant a camera that read the sky into a computer all night without a human present, and algorithms that flagged the movers by morning. She is one of the very few people who carried the whole arc personally, from the plate era into the autonomous era, and who helped push the transition itself.

The book also follows the science that her work served. Near-Earth asteroids were, in her early years, a curiosity, hunted by a handful of enthusiasts and dismissed by much of the profession as a fringe pursuit. By the end of her career they were a global enterprise, with a mandate from the United States Congress, with dedicated telescopes on several continents, and with a working answer to the question of where the next dangerous impact might come from. That change of standing was not automatic. It was argued for, plate by plate and discovery by discovery, by a small community in which Helin was a central

figure, and her programs supplied both the objects and the proof of method that made the larger effort plausible.

The chapters ahead move through her life, her instruments, and her discoveries in a deliberate order.

The reader will also meet a supporting cast that the formal record tends to flatten. The collaborators whose names share her comets, the operators who read plates beside her, the Air Force officers who lent a mountain telescope to a civilian search, the astronomers on other continents who confirmed her finds in their dawns: the census was a relay, and the chapters try to hand the baton to each runner visibly. A book about patience should be generous with credit, because patience, in this story, was nearly always a group performance. The early chapters set the scene: who she was, how she came to the work, and what the near-Earth population actually is, as orbits and as hazards.

The middle chapters follow the craft, the long nights of the photographic survey, the reading of plates, the mathematics of orbits, and the leap to electronic sensors. Later chapters gather the discoveries themselves, place her among her contemporaries, and carry the story forward past her death in 2009, into the era of the great digital surveys she helped make inevitable.

One thing the reader should know at the start, because it colors everything else.

A note on evidence, since the book makes claims and the reader deserves to know their footing. The facts here rest on the public record of the field: the discovery announcements and orbit files of the Minor Planet Center, the published papers of the two surveys and their collaborators, the naming citations in which the community explains its honors, and the memorial and biographical literature that grew after her death. Where the record is genuinely thin, on her childhood, for instance, the chapters say so rather than invent, and where a number is stated approximately, the approximation is honest.

A census taker's biography should be written with a census taker's care. Helin's kind of astronomy was not the astronomy of dramatic announcements. It was cumulative work, performed on schedule, in competition with the weather and the Moon and the sheer rarity of the quarry, and its drama was distributed across decades. A single night's plate might hold one new object among a million points of light, or none. A career of such nights produced a map of the neighborhood that science still uses. This book's argument, made in detail across fourteen chapters, is that the patient version of discovery deserves its own literature, and that Eleanor Helin is its best case.

Chapter 1: The Discovery of Eleanor Helin

Every survey astronomer is discovered by their subject before they discover anything, and Eleanor Helin's case fits the pattern in an instructive way. She was born Eleanor Francis on 19 November 1932, into a United States sliding from depression toward war, and the sky she grew up under was the fixed, starry ceiling that everyone assumed it to be. Nothing in her early years pointed obviously at minor planets. The path that carried her to them ran first through the Moon, and the route was opened by one of the century's great re-imaginations: the recognition, sharpening in the 1950s and 1960s, that craters are made by impacts, and that the impacting bodies are still out there.

The intellectual engine of that re-imagining was Eugene Shoemaker

Her surname changed twice and the second change explains a small confusion in the record. Born a Francis, she was known through her early career as Eleanor Helin from her first marriage, and the name Helin is the one the sky carries, in asteroid names and comet designations and the survey literature of three decades. Later in life she remarried and used the surname Francis Helin in formal contexts, which is why some of the record calls her Helin and some Helin Francis; the discoveries and the honors belong to one continuous person. The book follows the field's own usage and calls her Helin throughout, with her nickname, Glo, appearing where the story is human., the geologist turned planetary scientist who proved that Meteor Crater in Arizona was an impact scar and then set about counting the Moon's craters to show that its face recorded the same violence.

Helin joined this effort as a collaborator in the late 1960s, working with Shoemaker on the study of lunar craters, and the work changed her permanently. Crater counting is repetitive, detail-hungry labor, demanding exactly the mixture of patience and pattern recognition that would later define her asteroid hunting. It also plants a question that never leaves the person who has worked on it: if the craters record impacts, and the Moon is next door, then the bodies that make the craters are passing among us now.

In the early 1970s she turned that question into a program. Working from Palomar Mountain in southern California, where the California Institute of Technology operated a famous observatory built for deep-sky photography, she initiated the Palomar Planet-Crossing Asteroid Survey, usually shortened to PCAS, with Shoemaker as her scientific partner. The ambition behind the name was, for its day, almost reckless. Planet-crossing meant orbits that intersect the paths of the inner planets, which meant objects close enough to be fast, faint, and rare on any given plate, in an era when most asteroid work

catalogued the main belt between Mars and Jupiter, where the quarry was abundant and unhurried. Helin chose the difficult ground deliberately. The planet crossers were the impact-makers, the Moon's sculptors, and nobody was hunting them systematically.

Her instrument was the observatory's smallest major telescope, the 18-inch Schmidt, a wide-field camera of a design perfected decades earlier for exactly this kind of patrol work. A Schmidt telescope photographs large patches of sky sharply from edge to edge, trading aperture for field, and an asteroid search lives or dies on field of view. On a given night the survey aimed the little Schmidt at a strip of sky near the ecliptic, exposed glass plates for up to an hour, and moved on, hour after hour, filling the night with a dozen or more plates in the hope that something in the field had moved fast enough to streak.

The first reward came quickly by the standards of the field. On 3 July 1973, in the survey's first year, Helin found her first asteroid on a Palomar plate, and the moment fixed the pattern of the next three decades: expose, develop, examine, repeat, and once in a great while, reward. It is worth pausing on how modest the operation was. A survey that would eventually be credited with a substantial fraction of all the near-Earth asteroids then known began with one woman's initiative, a borrowed small telescope, glass plates bought in batches, and the conviction that the planet-crossing population was worth decades of a career.

The choice of Palomar itself deserves a word, because the mountain's culture shaped the work. Palomar was built around the great 200-inch Hale reflector, then the largest telescope on Earth, and its community measured prestige in light-gathering power and distance reached. The 18-inch Schmidt, in that company, was a workhorse instrument, notable for its field rather than its reach, and the planet-crossing survey occupied a modest niche on the mountain. The arrangement suited Helin's methods. Survey astronomy cannot compete for big-telescope time, night after night, year after year; it needs a telescope of its own, no matter how small, and the continuity the big instruments could not give.

What she built on that continuity, through the 1970s, was both a personal reputation and a new baseline for the field. Discoveries arrived on no schedule: the first of the great ones, the asteroid 2062 Aten, in the first week of 1976, and the second, 2100 Ra- Shalom, two years later. Each will get a chapter's attention later in this book. What matters here is the discovery of the discoverer, the process by which a scientist trained in crater counts and laboratory patience remade herself into the era's leading planetary sentry, on

the strength of a program she had to keep justifying, funding, and running, essentially, on her own.

It must also be said plainly, because the history of the field would otherwise be incomplete:

Her death closes the biography's frame and belongs in this chapter's record: she died on 25 January 2009, at seventy-six, still professionally engaged in the aftermath of her second survey, and the memorial notices from the field read unusually personally, colleagues writing about the person rather than the publications. The interval between her first discovery in 1973 and her last working years spans almost the entire modern history of the near-Earth asteroid as a subject, which means the book that follows is, unavoidably, partly a history of the field with one life as its spine. her entry into planetary astronomy was not handed to her.

American science in the middle of the twentieth century offered few of the institutional positions she would eventually fill to a woman, and the asteroid-hunting community of her early career was small, informal, and often unglamorous by the standards of the day. She established herself through production, discovery counts that no argument could dismiss, and through a program that outlasted every temporary obstacle. The subject discovered her, in the sense of the chapter's title, but the discovery was mutual and hard won.

End of free sample. The full book is available at putrabooks.github.io

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.