SAMPLE

Famous Astronomers: Stephen Hawking

Horizons, Time, and the Limits of Physics

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

Stephen Hawking was twenty-one years old, in his first year of graduate work at Cambridge, when two medical facts and one physical fact arrived in the same season and set the shape of everything after. The medical facts came in January 1963: the diagnosis was amyotrophic lateral sclerosis, motor neurone disease, and the prognosis was two years. The physical fact had been developing in physics for a decade: the general theory of relativity, left in elegant isolation for forty years, was being rejoined to the study of the universe's most extreme objects, and the young researchers entering that reunion were about to open the golden age of black hole theory.

Hawking, told he would not live to finish a doctorate, finished one that helped reopen the deepest question in physics, and then spent half a century working at the frontier from a wheelchair, communicating first through a weakened voice, then through a synthesized one, and producing a body of results that changed what the field means by the words space, time, and information. This book is the account of that life, written for the Famous Astronomers series, and it takes the position that the life and the science have to be told together, because the two are inseparable in the record and were inseparable in the man.

The science alone would earn the biography. Hawking's name attaches to the singularity theorems, which proved that the collapse of a massive star ends not in some unspecifiable impasse but in a genuine edge of spacetime, and to the extension of that result to the universe's own beginning. It attaches to the four laws of black hole mechanics, which showed that the geometry of a black hole obeys rules that look like thermodynamics, and to the calculation of 1974 that made the resemblance literal: black holes radiate, they have a temperature, they evaporate. The radiation now carries his name, and its discovery moved black holes from the status of mathematical pathology to that of physical objects with heat, entropy, and a life cycle.

His later decades produced the no-boundary proposal for the universe's initial state, decades of argument about the fate of the information a black hole swallows, and, near the end, a proposal about how that information might be preserved in the soft structure of spacetime itself. Each of those results has a chapter here, stated in plain language, with the mathematics described rather than displayed.

The fame alone would also earn the biography, because Hawking became the most widely recognized scientist of the late twentieth century, and the fame is a historical fact with its own mechanics. A Brief History of Time, published in

1988, stayed on the bestseller lists for more than four years and sold more than twenty million copies, and its author became a public figure whose appearances in sitcoms, on stages with rock bands, and in the opening ceremony of a Paralympic games were part of a deliberate and largely successful campaign to put cosmology in the living room. The wheelchair, the synthesizer voice, and the physics became one public image, and the image carried an uncomfortable question that the book addresses directly: how much of the fame was the science and how much was the spectacle, and the truthful reply is that the two were fused, and that the fusion did measurable good to both.

The account is built from the settled record: the published papers and their dates, the standard biographies and interviews, the documentary record of the collaborations, and the public statements the man made about his own life. Where the celebrated anecdotes survive in competing tellings, the Cygnus X-1 wager among them, the tellings are given side by side. The private life, the first marriage and its strains and the second and its collapse, is treated where it touched the public record and the work, with the restraint that the people involved, some living, have earned. The story runs from an Oxford birth in the same week as the three hundredth anniversary of Galileo's death to ashes placed in Westminster Abbey between Newton and Darwin, and a life that ran that course, against a diagnosis that gave it two years, deserves the most accurate telling it can get.

A sidelight on the birth year that the biographies all note: the family had moved to Oxford from London for the birth because the capital, in the war's third year, was the target of the bombing, and the university cities had been declared open towns, and the mother's evacuation for the confinement is the reason the subject's papers state Oxford as the birthplace. The war shadows the childhood directly after: the V weapons arrived over the London suburbs in the last year of the war, the family kept a shelter and a bicycle escape plan, and the boy's earliest memories, given in his own memoir, are of the shelters, the sirens, and the searchlights, a beginning in the century's worst years that the biographies have always read, rightly, as part of the frame, since the century's violence and the century's physics were both in the air the child breathed.

Chapter 1: The Discovery of Stephen Hawking

The subject arrived in Oxford on the eighth of January, 1942, in the middle of a war, to parents who were both

Oxford graduates in a family that had, unusually for the time, produced women scholars on the mother's side. The coincidence of the date is the first famous fact of the life: Galileo Galilei died on the same calendar day in 1642, three hundred years to the week before the birth, a fact Hawking himself found less meaningful than everyone else did, noting that a quarter of a million other babies shared the birthday, but which the biographies have never let go, and this one will not either, because the life did in the end run from the death of the first modern cosmologist to the court of the heirs of Newton.

The childhood was bookish, eccentric by the standards of the suburban neighborhoods the family occupied, and successful in the way that mattered for what followed. The father, Frank Hawking, was a physician and a research biologist who expected his eldest son to follow him into medicine, and the household had bicycles instead of a car, bees in the cellar and, at various addresses, a certain genteel poverty managed by a mother who also worked as a secretary and a tax inspector. The boy's gifts showed early in conversation and late in reading, since he learned to read only around the age of seven or eight by his own account, but the direction of the mind was visible: the family called him Einstein at his rocking-chair games, he asked questions about the stars that his elders could not answer, and by St Albans School he was one of a group of friends who built a working computer out of an old telephone switchboard, relays and bulbs and scrounged parts, in the family garden house.

The headmaster who wrote his schools recommendation and the teacher who bet against his first-class degree both appear in the record, and the bets direction, against him, is a detail the subject enjoyed retelling.

Oxford took him at seventeen, on a scholarship, to University College, where his father had studied and where the young man wanted mathematics and was settled, because mathematics was not on offer in the college that year, into physics, a substitution the century has reason to be grateful for. The Oxford years are a study in the gap between ability and application: the coursework was so far below what he wanted that he did, by his own account, very little work, spent hours on the river as coxswain of the college rowing crew, a role that required being small, loud, and unbothered by being thrown into water, and finished the final examination with a result on the border of the first and second class, decided by an oral examination in which he told the

examiners, in effect, to give him the first.

They did. The rowing, the lounging, and the casual brilliance of the exit interview all belong to the discovery of the man, because the physics he did later was done with exactly that temperament: minimal ceremony, maximal confidence, and the expectation that problems would yield.

Cambridge followed in 1962, and the arrival brought the first crisis. His hope had been to work with Fred Hoyle, the most famous cosmologist in Britain, but

Hoyle had no room and Hawking was assigned instead to Dennis Sciama, a physicist he had not heard of and was disappointed to get, and by the end of the decade he was calling the assignment the best thing that ever happened to him, because Sciama, warm, encyclopedic and generous with his students' careers, ran a school that produced a generation of leaders in the field. The deeper crisis was medical.

At Oxford the clumsiness had started, a fall down a stair, dropped glasses, an oarsman who could not tie his own shoelaces tightly, and at Cambridge the symptoms crossed the line that could not be explained away: a fall on the ice, a winter of worsening speech, and a friend's observation that his hands no longer worked properly. The tests at the hospital in early 1963 returned the diagnosis and the prognosis, and the story of what followed begins with the fact that the prognosis was wrong, not by a little but by half a century, and that the man who was told to prepare for the end of everything instead met the woman he was about to marry and began the work that made him famous, as though the deadline were a stimulus.

The two years that followed the diagnosis are the hinge of the biography and the reason it reads as it does. Jane Wilde, a languages student he had met at a party while the tests were being done, married him in July 1965, and the marriage, with its three children, its round the clock care, its students who moved in to help, and its eventual strains, is part of the scientific record in the most literal sense, because the work of the following decade was done inside the domestic arrangement that she held together. The disease progressed more slowly than the doctors forecast, confining him first to sticks, then to a wheelchair by the end of the sixties, and taking his speech by degrees through the seventies.

The discovery of Stephen Hawking, as a public fact, came in stages to match: the colleague at Gonville and Caius from 1965, the rising theorist of the singularity papers, the Lucasian Professor at thirty-seven, and then, in the 1980s and 1990s, the figure the world knows, the man in the chair with the voice.

A sidelight on the understanding: the three parts did not develop in the order the public assumes. The illness arrived first and the public fame last, with the science in between, and the pattern of the middle decades is the one that made the whole intelligible, since the scientific career was fully formed, the Lucasian chair, the radiation papers, the standing in the field, before the world had heard of him. The fame, when it came in 1988, was therefore fame for work already done, which is a rarer sequence than fame contemporaneous with the work, and the sequence gave the public figure a solidity that contemporaneous celebrity lacks: the world's most famous physicist was already a complete physicist when the world found him, and the books the world read were the summary of a career rather than the promise of one.

One more element belongs in the understanding: the conservatism of the man's scientific taste, which the fame, always drawn to the radical, consistently mislabels. The record of the positions shows a theorist who resisted the fashionable more often than he led it: he doubted the radiation's own reality for months before surrendering to the calculation, he resisted the entropy reading he later completed, he fought the information's return for three decades, and he was among the string theory program's public skeptics on the question of uniqueness. The understanding of the scientific personality is therefore of a man the field's own history would call a conservative radical, radical in the questions and conservative in the answers, and the label matters because the public image, the visionary in the chair, is the figure the image wanted and not the one the papers show, and the papers are the evidence.

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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.