# SAMPLE

## Great Observatories: Mount Wilson Observatory

Where the Universe Expanded

Aira Astralis

Free sample: Introduction & Chapter 1

putrabooks.github.io

**Buy the full book:**

Carousell carousell.sg/p/great-observatories-mount-wilson-observatory-ebook-pdf-1468028328

Ko-fi

Payhip

# Contents

Introduction

Chapter 1: The Discovery of Mount Wilson Observatory

Chapter 2: Understanding Mount Wilson Observatory

Chapter 3: Key Characteristics of Mount Wilson Observatory

Chapter 4: The Science Behind Mount Wilson Observatory

Chapter 5: Observation and Measurement of Mount Wilson Observatory

Chapter 6: Important Features of Mount Wilson Observatory

Chapter 7: Mount Wilson Observatory in Context

Chapter 8: Modern Understanding of Mount Wilson Observatory

Chapter 9: Research and Exploration of Mount Wilson Observatory

Chapter 10: Significant Discoveries About Mount Wilson Observatory

Chapter 11: Challenges and Mysteries of Mount Wilson Observatory

Chapter 12: Future Directions in Mount Wilson Observatory Research

Chapter 13: Fun Facts and Trivia About Mount Wilson Observatory

Chapter 14: Conclusion: The Significance of Mount Wilson Observatory

Conclusion

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

# Introduction

There is a mountain above Los Angeles where the twentieth century's picture of the universe was assembled. Mount Wilson, a peak of the San Gabriel range standing near five thousand seven hundred feet, holds an observatory whose telescopes, built in the first two decades of the century, made the discoveries that ended the old cosmos and opened the new one: the sun proved to be a magnetic star, the Milky Way proved to be one galaxy among many, the universe proved to be expanding, and a star's diameter proved to be measurable. Any one of these results would carry an observatory into history; all four came from the same mountain, within about twenty years, and the story of how they came is the story this book tells.

The observatory was founded by George Ellery Hale, the era's great builder of scientific institutions, who chose the mountain for the steadiness of its air and for its long seasons of clear sky, and who raised the money, from the Carnegie Institution and from private donors, for a sequence of instruments each larger than the last: the Snow solar telescope in 1905, the sixty-inch reflector in 1908, the hundred-inch Hooker telescope in 1917, the solar towers that stood between them. The strategy was simple and radical: put the world's best instruments in the world's best air, staff them with the era's best observers, and let the universe answer. It answered.

The cast included the founding generation of modern astronomy. Hale himself, working with the solar telescopes, found the magnetic fields of sunspots in 1908, the first magnetic field detected outside the Earth. Edwin Hubble, with the hundred-inch, found the first Cepheid variable in a spiral nebula in 1923 and showed that Andromeda was a galaxy beyond the Milky Way, then joined the evidence for the expanding universe. Walter Adams and his colleagues turned the observatory's spectrographs into a machine for classifying the stars and, along the way, identified the white dwarfs. Albert Michelson, the first American Nobel laureate in the sciences, mounted his stellar interferometer on the hundred-inch and measured the diameter of Betelgeuse, the first star ever measured for size.

The chapters that follow carry the series' standard plan, turned here on an institution rather than a person: the discovery of the mountain itself, the understanding of what made it special, the science done there, the instruments and their measurement programs, the observatory in its context, the modern understanding of the work, the challenges from smog and light and fire, the present life of the mountain under the CHARA interferometer, and the future. The aim throughout is the series' standing one: to show what one stubborn institution added to knowledge, and what the century did with the

addition.

A word on how to read what follows. The observatory's story is usually told through its famous decade, the 1920s, and through the hundred-inch telescope that dominated it, but the mountain's full record is longer and wider than its golden age: the solar program that founded it and still runs, the stellar spectroscopy that mapped the galaxy, the interferometry that began with a single star and ended as an industry, and the modern survival of the whole institution in a century that moved the science to darker mountains. The chapters that follow give the golden age its due and the rest of the record its fair share, and the reader who wants the famous parts will find them where they belong, inside the longer story of the mountain's air, instruments, and people.

One more framing note: the observatory's history is inseparable from the growth of the city below it, and the tension between the two, science and metropolis sharing a peak, is a running thread of this book. The mountain was chosen for its emptiness, the city grew to fill the basin beneath, and the observatory's whole modern history is the account of what an institution does when the world around it changes. The answer the mountain gives, keep the air working, keep the record running, keep the doors open, is the practical philosophy the closing chapters assess.

A last note on names, since the mountain's are its history. The peak carries a surveyor's name; the solar telescope carries a Chicago donor's; the hundred-inch carries a Los Angeles merchant's; the towers carry no names but their heights; and the modern array carries an acronym of its method. The naming pattern, donors and founders rather than scientists, is itself a record of the institution's economics, and the observatory's one scientific christening, the space telescope that bears the name of the mountain's most famous observer, arrived only in the orbiting era, a century after the founding. The names of Mount Wilson are the money and the method, and the science lives in the papers.

The chapters that follow are the mountain's biography, and like all the biographies in this series, they measure rather than admire: the air by its steadiness, the instruments by their results, the people by their papers, and the institution by what outlived them all.

# Chapter 1: The Discovery of Mount Wilson Observatory

The mountain had been known, named, and even developed before the astronomers came. Mount Wilson, the peak the surveyor Benjamin Wilson had used in the 1850s and after whom it was named, stood above the young city of Los Angeles, and by the 1880s it held a hotel reached by a toll road, a place where the city's residents escaped the summer heat. The first serious proposal to put a telescope on the mountain came in that decade from Edward Falles Spence, a founder of the University of Southern California, who died before the funding was assembled, and for a decade after his death the idea waited.

The man who picked it up was George Ellery Hale, an astronomer of insatiable institutional appetite, who had already founded the Yerkes Observatory in Wisconsin around its forty-inch refractor, the greatest refractor ever constructed. Hale's scientific obsession was the Sun, and his insight was that solar physics needed a permanent mountain station: a place above the haze, with steady air and long runs of clear days, where a dedicated solar telescope could watch the Sun daily instead of waiting for eclipses. He had tested California mountain sites in 1903, found the air above the hotel on Mount Wilson remarkably steady, and made his decision. The Carnegie Institution of Washington, newly founded and looking for exactly this kind of bold program, agreed to fund a solar observatory in 1904, leasing land from the hotel's owners with a condition of public access attached, and the Mount Wilson Solar Observatory was born.

The first instrument arrived in pieces and went to work almost immediately. The Snow solar telescope, a horizontal instrument with a twenty-four-inch mirror feeding a long focal length, had been donated to Yerkes by Helen Snow of Chicago, and Hale shipped it west in 1904-1905 and installed it in its own building on the mountain. It was the world's first permanently mounted solar telescope, a milestone whose importance is easy to miss: before it, solar telescopes were portable instruments carried to eclipses, and the daily monitoring of the Sun that solar physics requires was impossible. With the Snow telescope in service, the Sun could be observed every clear day, its spectra and images archived in runs, and the discipline of solar physics as a continuous program began.

The Snow telescope's location was not ideal, since the horizontal light path sat in turbulent ground-level air, and the solution became the observatory's architectural signature: the tower telescope, in which the light comes down a vertical shaft through steadier air to the instruments at the bottom. The sixty-

foot solar tower was completed in 1908, followed by the hundred-fifty-foot tower in 1912, and the towers, still standing and still used, became the working home of solar physics on the mountain. The design was copied around the world, and the tower telescope became the standard form of the solar observatory.

The nighttime program grew alongside the solar one, on a logic Hale articulated throughout his career: bigger telescopes see farther, and farther is where the new questions are. The sixty-inch reflector, funded by Hale's father with a glass blank from the Saint-Gobain works in France, was completed in 1908 and was the largest operating telescope in the world when it saw first light. Nine years later, after years of struggle with the casting of its hundred-inch blank, the Hooker telescope took the title, and the mountain held it for three decades, until the two-hundred-inch Hale telescope at Palomar saw first light in 1949.

The discovery of the observatory, then, is the discovery of a method: choose the site for the air, build the instrument for the question, and repeat. The chapters that follow carry the method through its consequences, which were, taken together, the remaking of the universe as the twentieth century came to understand it.

The founding years deserve a slower look, since they set the pattern the century followed. Hale's site campaign of 1903 was itself a new kind of procedure: he tested candidate mountains with portable instruments, measuring the steadiness of star images through the nights, and chose Mount Wilson on data rather than reputation. The lease from the hotel's owners, negotiated with the public-access clause that the observatory still honors, gave the new station its ground; the Carnegie Institution's funding gave it its independence; and the Snow telescope's move from Wisconsin, a working instrument shipped across a continent to a new site, gave it its first tool. Within a year of the first observations the mountain had its first results, and within five it had the largest telescope in the world.

The early logistics belong in the discovery record too, since they explain the observatory's shape. Everything came up the mountain by road: the building materials for the dormitories and shops, the Snow telescope's mount and mirror, the sixty-inch's hundred-ton assembly, and finally the hundred-inch's mass, the mirror alone weighing tons, its mounting and dome in hundreds of pieces. The road, first the toll road of the hotel era and then the modern highway, was the observatory's lifeline and its limitation, and the mule teams and trucks that ran it are as much the institution's founders as any of the scientists. A mountain observatory is a logistics project wearing a scientific

costume, and Mount Wilson's founding was a decade of freight.

One more detail of the founding completes the picture: the observatory's parentage moved quickly in its first years, from the Carnegie Institution's initial sponsorship of a solar observatory to the fuller establishment of the Mount Wilson organization, and the name changed with the mission, from the Mount Wilson Solar Observatory to the Mount Wilson Observatory as the nighttime instruments outgrew the founding purpose. The change, made in 1919, marked the institution's arrival at its mature form, the equal partnership of the solar and stellar programs that its history has held since. The naming history is small, but it is the institution's own account of what it became: not a solar station that grew, but an observatory that happened to start with the Sun.

The discovery chapter's last word belongs to the founder's own account of it, which he gave many times: the mountain was chosen because the seeing was good, and everything followed. The sentence is modest and true, and the chapters that follow are its verification, since the good seeing, patiently exploited, is the shortest honest account of everything Mount Wilson became.

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.