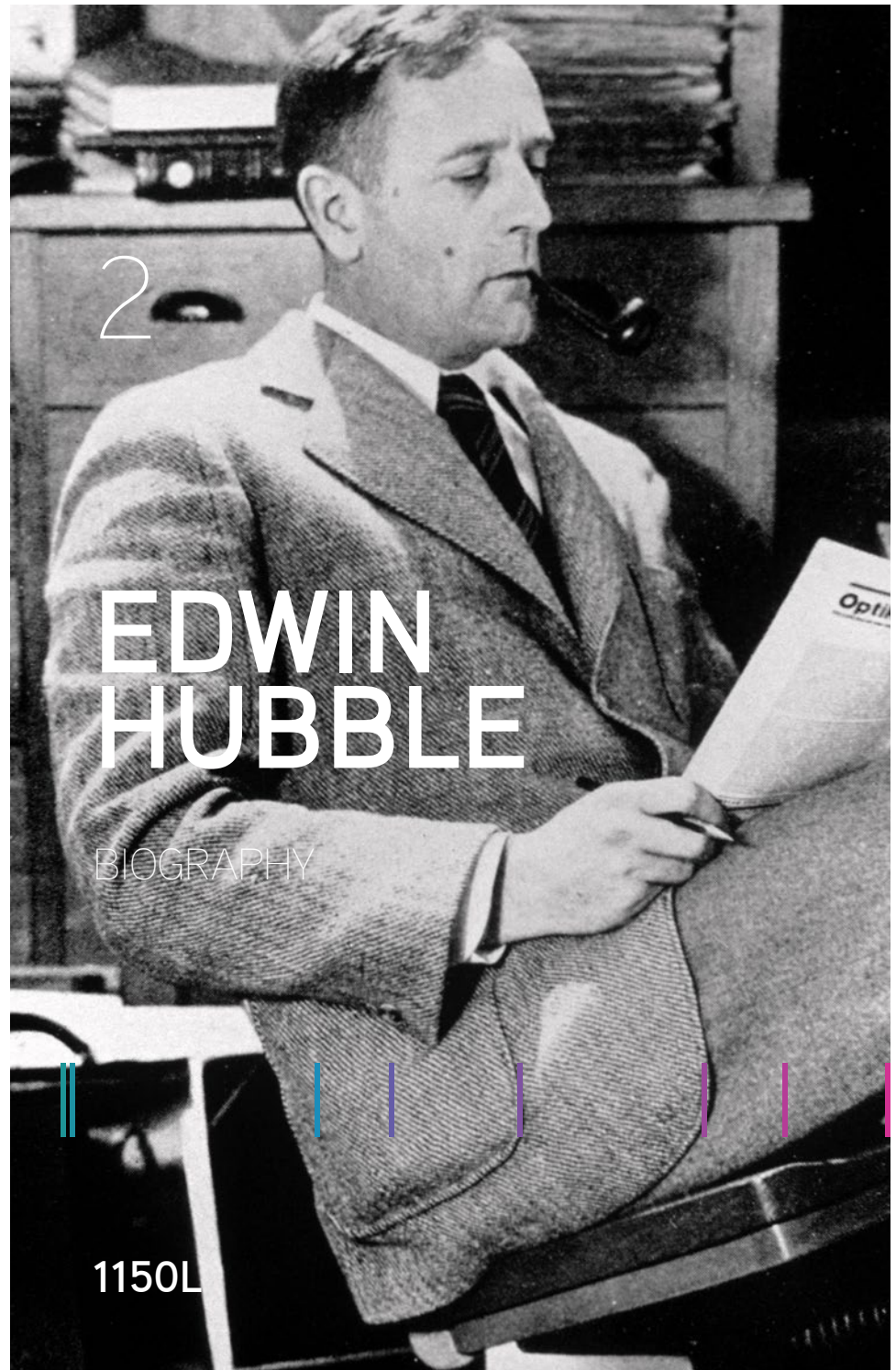


2

# EDWIN HUBBLE

BIOGRAPHY



BIG HISTORY PROJECT

1150L

# EDWIN HUBBLE

EVIDENCE FOR AN  
EXPANDING UNIVERSE

By Cynthia Stokes Brown

**Born**  
November 20, 1889  
Marshfield, Missouri

**Died**  
September 28, 1953  
San Marino, California

In the course of five years, Edwin Hubble twice changed our understanding of the Universe, helping to lay the foundations for the Big Bang theory. First he demonstrated that the Universe was much larger than previously thought, then he proved that the Universe is expanding.

Edwin Powell Hubble was the son of an insurance executive who grew up outside Chicago. He was more outstanding as an athlete than as a student, although he did earn good grades in every subject (except spelling).

At the University of Chicago, Hubble studied mathematics, astronomy, and philosophy — and played for the school's basketball team. He graduated with a bachelor of science in 1910, and then spent 1911 to 1914 earning his master's as one of Oxford University's first Rhodes scholars. Though he studied law and Spanish there, his love of astronomy never diminished.

## At Yerkes Observatory

Moving back to the United States, Hubble enrolled as a graduate student at the University of Chicago and studied the stars at their Yerkes Observatory in Wisconsin. It was here that he began to study the faint nebulae that would be the key to his greatest discoveries. After receiving his doctorate in astronomy from the University of Chicago in 1917, he won an offer to join the staff at the prestigious Mount Wilson Observatory, near Pasadena, California.





Hubble used the Hooker Telescope at Mount Wilson Observatory for some of his most important discoveries

## At Mount Wilson Observatory

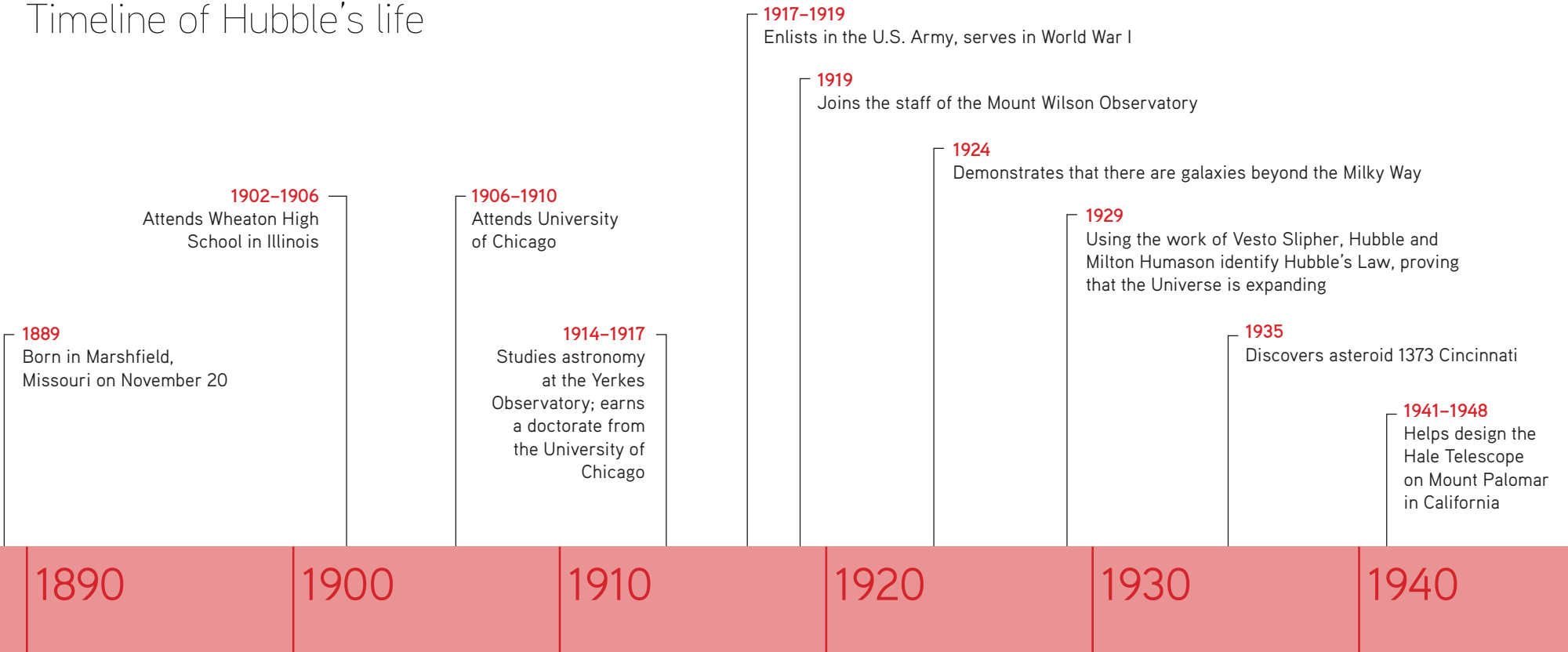
Arriving at Mount Wilson in 1919, he joined an astronomy establishment that was just beginning to grasp cosmic distances. The key to that effort was work that had been done studying Cepheid variable stars, roughly a decade earlier, by Henrietta Swan Leavitt at Harvard. These stars brighten and dim in a predictable pattern, and their distance from us can be worked out by measuring how bright they appear to us.

Another astronomer at the observatory, Harlow Shapley, built on Leavitt's findings and shocked the world with his conclusions about the size of the Milky Way. Using the Cepheid variables, Shapley judged that the Milky Way was 300,000 light years across — 10 times bigger than previously thought.

Hubble began his work at Mount Wilson just as the new 2.56-meter Hooker Telescope, the most powerful on Earth, was completed. With it, he was able to peer into the sky with greater detail than anyone had previously. After years of observation, Hubble made an extraordinary discovery. In 1923 he spotted a Cepheid variable star in what was known as the Andromeda Nebula. Using Leavitt's techniques, he was able to show that Andromeda was nearly 1 million light years away and clearly a galaxy in its own right, not a gas cloud.

Hubble then went on to discover Cepheids in multiple nebulae, and proved, in a 1924 paper called "Cepheids in Spiral Nebula," that galaxies existed outside our own. Overnight, he became the most famous astronomer in the world, and people everywhere had to get used to the fact that the Universe was far vaster than anyone had imagined. Shapley, for one, was shaken by the news. He wrote Hubble, "I do not know whether I am sorry or glad to see this break in the nebular problem. Perhaps both."

# Timeline of Hubble's life



1890

1900

1910

1920

1930

1940

1901  
The Nobel Prize is founded by Swedish inventor Alfred Nobel

1903  
Marie Curie shares the Nobel Prize in physics with Pierre Curie and Henri Becquerel

1914  
World War I begins

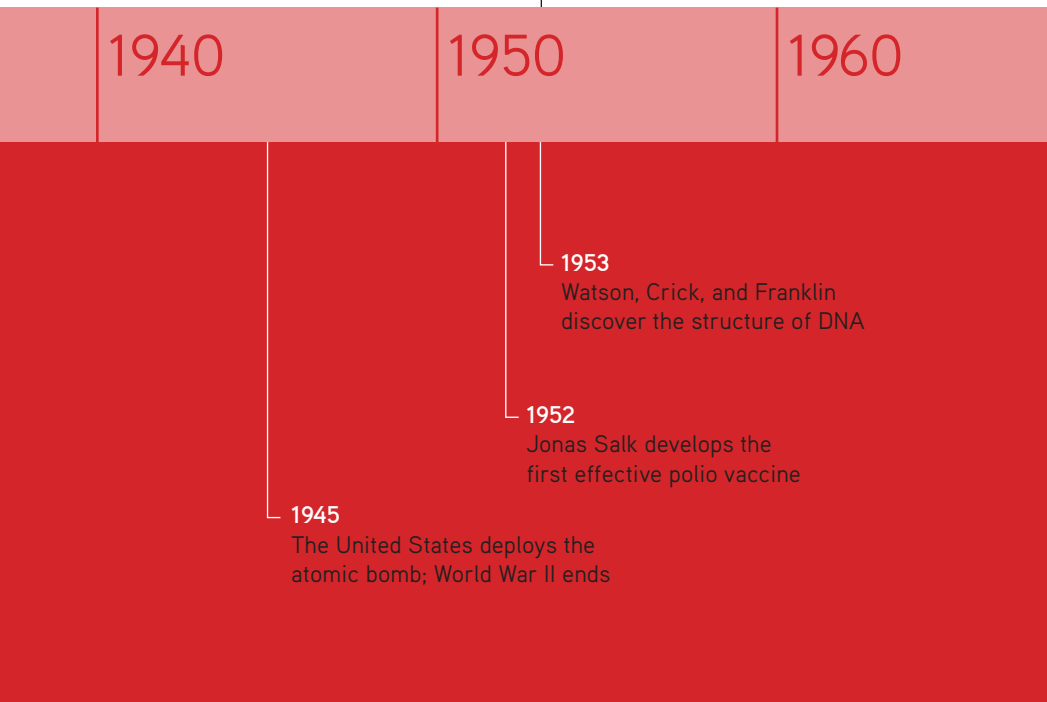
1907  
Dmitri Mendeleev dies in St. Petersburg, Russia

1921  
Albert Einstein receives the Nobel Prize in physics

1928  
Biologist Alexander Fleming discovers penicillin

1939  
Nazi invasion of Poland triggers the start of World War II

During the time of Hubble



In 1926, while developing a classification system for galaxies, Hubble discovered an odd fact: Almost every galaxy he observed appeared to be moving away from the Earth. He knew this because the light coming from the galaxies exhibited redshift. Light waves from distant galaxies get stretched by the expansion of the Universe on their way to Earth. This shifts visible light toward the red end of the spectrum.

Building on the work of Vesto Slipher, who measured the redshifts associated with galaxies more than a decade earlier, Hubble and his assistant, Milton Humason, discovered a rough proportionality between the distances and redshifts of 46 galaxies they studied. By 1929 they had formulated what became known as Hubble's Law. Hubble's Law basically states that the greater the distance of a galaxy from ours, the faster it recedes. It was proof that the Universe is expanding.

It was also the first observational support for a new theory on the origin of the Universe proposed by Georges Lemaitre: the Big Bang. After all, an expanding Universe must once have been smaller.

## Later life

Hubble achieved scientific superstardom for his discoveries and is still considered a brilliant observational astronomer. He ran the Mount Wilson Observatory for the rest of his life, popularized astronomy through books and lectures, and worked to have astronomy recognized by the Nobel Prize committee.

He also played a pivotal role in the design and construction of the Hale Telescope, on Palomar Mountain, California. At 5.08 meters, the Hale was four times as powerful as the Hooker Telescope and existed as the most advanced telescope on Earth for some time. After its completion in 1948, Edwin Hubble was given the honor of first use. When asked by a reporter what he expected to find, Hubble answered: "We hope to find something we hadn't expected."

# Sources

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New York: Broadway Books, 2003.

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Chicago: University of Chicago Press, 1995.

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Hubble using the Hooker Telescope at Mount Wilson Observatory  
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