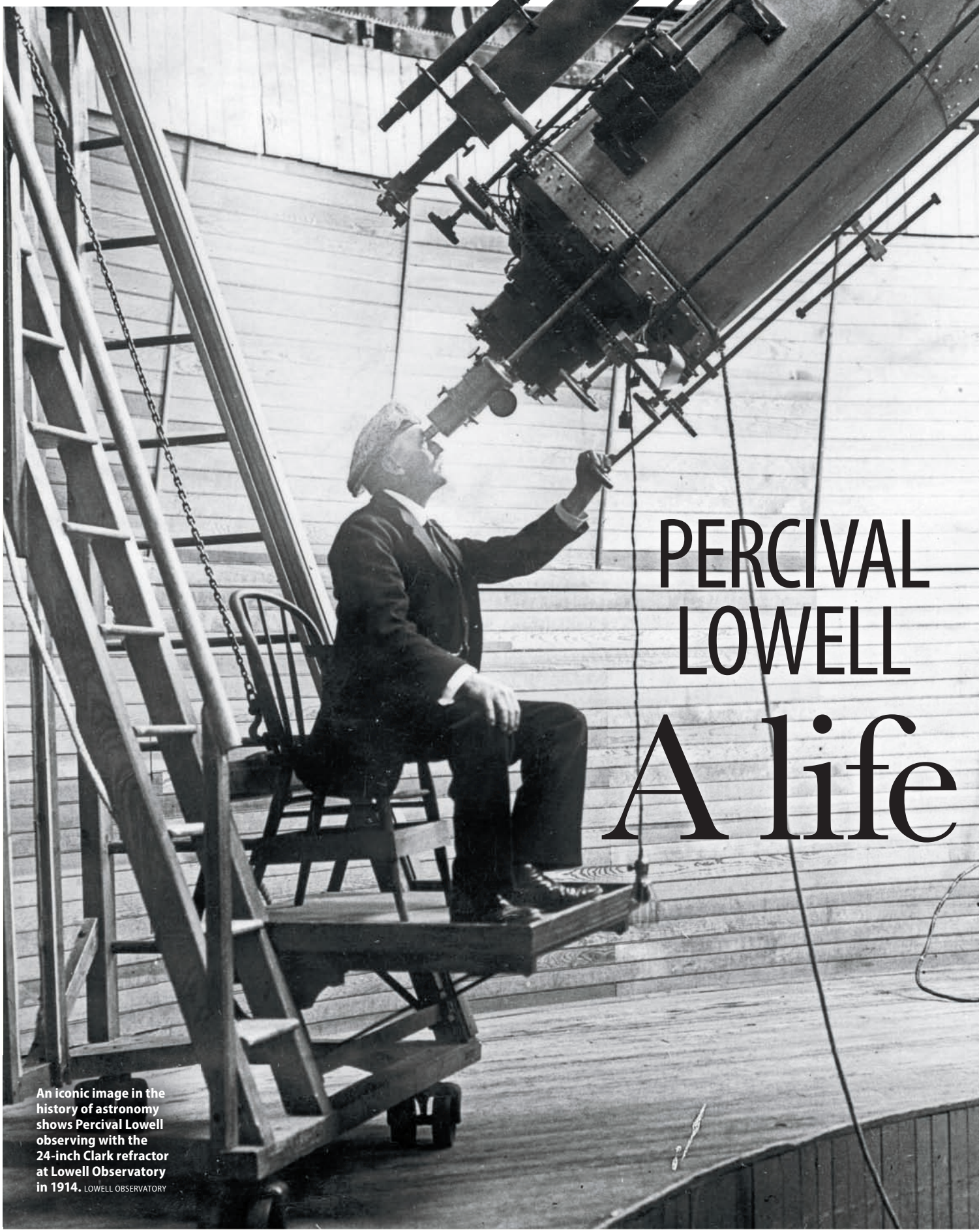


PERCIVAL LOWELL
A life

An iconic image in the history of astronomy shows Percival Lowell observing with the 24-inch Clark refractor at Lowell Observatory in 1914. LOWELL OBSERVATORY

One of the most curious characters in the history of astronomy produced a legacy of important work, and established the desert southwest as an astronomical mecca.

by Kevin Schindler

1. Comet Donati, which Lowell remembered viewing when he was 3 years old. E. WEISS, BILDERATLAS DER STERENWELT/KEVIN SCHINDLER

in astronomy

WHAT DO PERCIVAL LOWELL AND GEORGE BAILEY HAVE IN COMMON? WELL, STICK WITH ME.

In the beginning of the movie *It's a Wonderful Life*, angel wannabe Clarence Odbody is called to help downtrodden George Bailey realize his life was not a waste of time, but rather one of importance and meaning. Clarence gets his point across by showing George how much differently the future would have played out if George had never been born. George, for example, isn't around to save his brother Harry from drowning during a boyhood accident, and thus Harry is not around to save the lives of a transport of soldiers during World War II. The story goes on, and George finally realizes what a significant impact he had on so many lives.

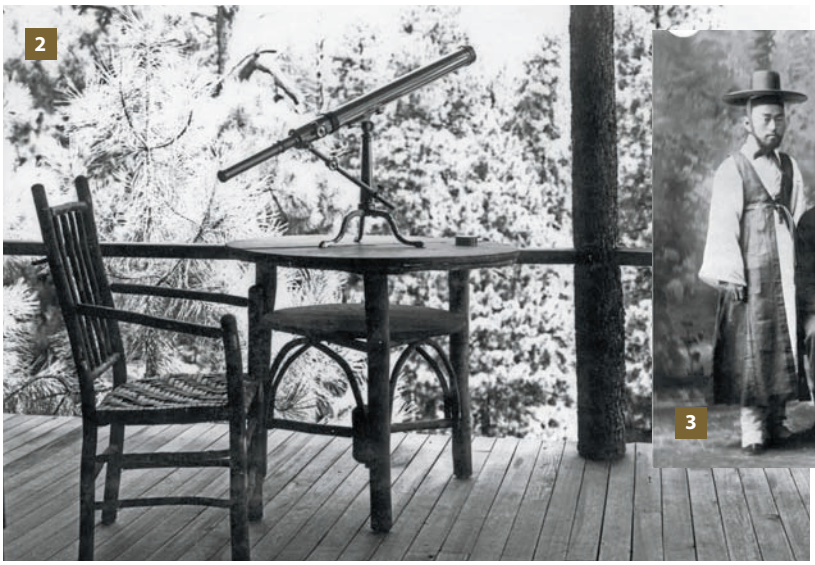
This narrative is an approach that paleontologist Stephen Jay Gould used to illustrate his contingency theory. Essentially, any circumstance is the result of a number of pre-existing factors, and if one of those factors is changed, the future would be altered. This exercise in what might have been can be fruitful in considering how Percival Lowell impacted astronomy as we ponder the 100th anniversary of his death this past November.

Growing up Lowell

Lowell was born into an elite Boston family known for its accomplishments in areas ranging from commerce to academia. The family produced more than its fair share of businessmen, judges, writers, industrialists, ministers, philanthropists, and architects. The family motto, *occasionem cognosce*, means "know your opportunity," and family members took this to heart in pursuing excellence. To be a Lowell meant not merely relying on the family wealth to sail through life. Instead, family members were expected to assume leadership roles, whether in their chosen vocation or community activities.

Percival arrived in 1855, the eldest of seven children. (Five — two boys and three girls— survived to adulthood.) As Percival's brother, Abbott, noted in his biography of Percival, their father instilled in the children the Lowell work ethic: "Somehow he made us feel that every self-respecting man must work at something that is worthwhile, and do it very hard. In our case it need not be remunerative, for he had enough to provide for that; but it must be of real significance." So was developed the drive and fortitude that would carry Percival through his life, and the passion that would feed his desire to succeed and "plow his own furrow," as Abbott put it.

Percival studied mathematics at Harvard University and then worked at a desk for eight years, overseeing many of the financial aspects of the family's mills and other interests. But for a man instilled with a passionate spirit of adventure, discovery, and wanderlust, this arrangement wouldn't last. He soon bolted overseas, spending the better part of 10 years in Korea and Japan. There he studied the traditions, values, and religious practices of Eastern cultures. In a pattern he would repeat in later years in the field of astronomy, he immersed himself in these studies and then wrote several books articulating his observations and conclusions. His orientology work alone was a contribution of



2. The 2¼-inch scope Lowell's mother gave to him on his 15th birthday. LOWELL OBSERVATORY

3. Lowell (front row, far left) serving as a diplomat to a Korean delegation in 1883. LOWELL OBSERVATORY

4. The historic telegram from Lowell to Andrew Douglass clarifying the name of the newly established observatory. LOWELL OBSERVATORY

"real significance," as Percival's father expected of the family, but remains today a footnote in light of Lowell's far more famous work in astronomy.

Lowell Observatory

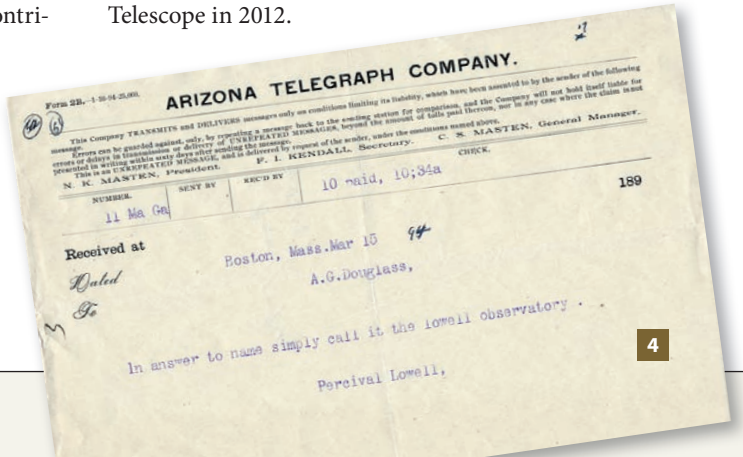
Astronomy was one of Percival's many interests during childhood. Later in life, he recalled, "Donati's Comet of 1858 was my earliest recollection. I can still feel the small boy inside me, halfway up a winding staircase, gazing with all his soul where the stranger stood." For Percival's 15th birthday, his mother bought him a 2¼-inch refracting telescope that he used to observe the polar ice caps of Mars from the roof of the family's home in Brookline, Massachusetts. For his last visit to the Far East, he carried along a newly purchased 1892-model Clark refracting telescope. All of this was prelude to his decision in 1893 to build his own observatory to study Mars, in particular the *canali* made famous by Italian astronomer Giovanni Schiaparelli.

On May 28, 1894, Lowell arrived in Flagstaff, Arizona, symbolically kicking off the final stage of his life, one that would bring him mixed doses of admiration (from the public), ridicule (mostly from the scientific community), fame, and notoriety. The 39-year-old self-taught astronomer entered the field with his typical gusto and would never leave it, even when death called on November 12, 1916. The work of the people he hired, the projects he started, and the philosophies he established at his observatory would long outlive him and establish him as an astronomical visionary. Lowell made at least eight different contributions that had far-ranging impact.

First, Lowell committed himself to building his own observatory to study astronomy and supported this decision by paying all the expenses. He chose to establish this facility independent of any university or existing observatory so that he could maintain control over all decisions, including the focus of research, purchase of equipment, and hiring of staff. In his will, he stipulated, "The Lowell Observatory shall at no time be merged or joined with any other institution." Future observatory leaders maintained this arrangement, and the private, independent nature of the observatory, with no overarching umbrella organization over it, continues to be one of its outstanding features.

Lowell's commitment to building his observatory in Flagstaff had the unanticipated impact of establishing the town as a center for scientific research. Prior to this, early surveyors through the area made a handful of scientific observations as part of their efforts to establish travel routes. Later, dedicated expeditions led by the likes of John Wesley Powell explored northern Arizona. But scientific study of the area didn't begin to mature until Lowell built his observatory, the first permanent scientific establishment in an area that now boasts dozens.

Second, toward the end of his life, Lowell established a trust to financially support his observatory in perpetuity. He devised an organizational structure patterned after his family's educational foundation, the Lowell Institute, in which a sole trustee manages the funds. Again in his will, he stated, "Ten percent of the net income shall be added yearly to the principal, and the balance of the net income shall be used for carrying on the study of astronomy, and especially the study of our solar system and its evolution." This nest egg would prove crucial to the survival of the observatory in future years, first as one of its only sources of income, and later to help balance the ledger sheets during times of reduced outside funding. In recent years, observatory leaders leveraged this trust to help complete construction of Lowell's Discovery Channel Telescope in 2012.

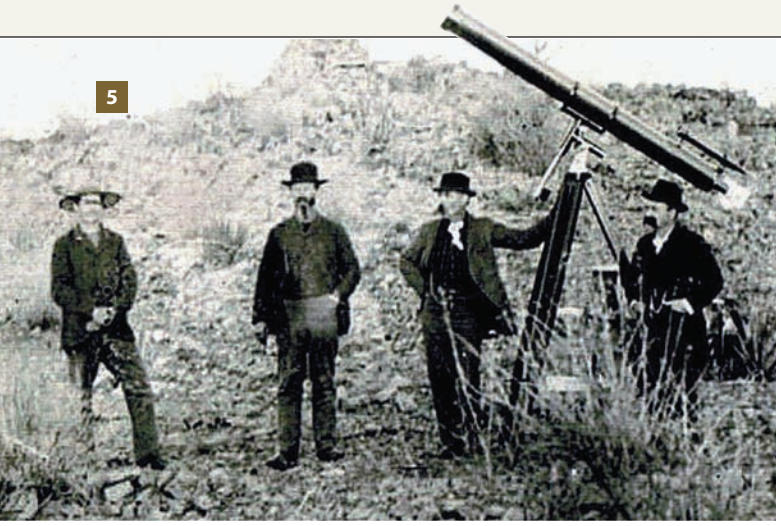

ARIZONA TELEGRAPH COMPANY.

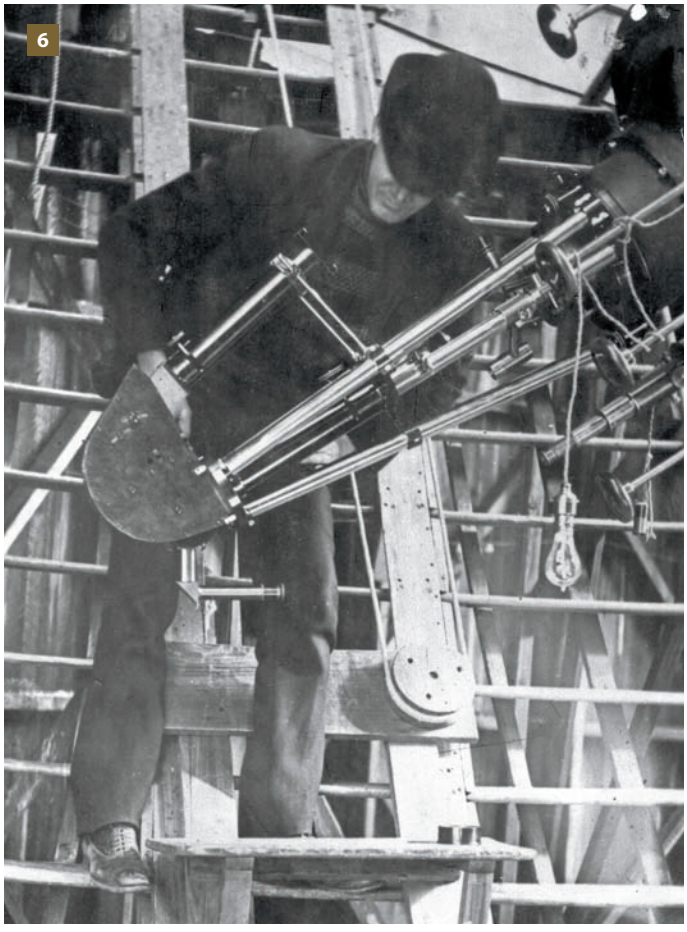
Received at Boston, Mass. Mar 15

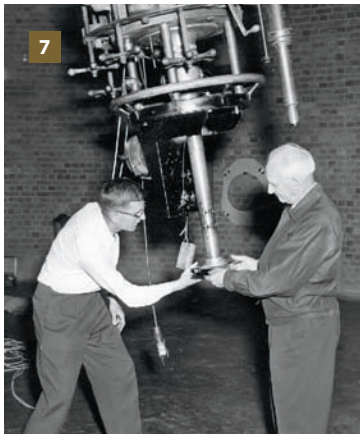
A.G.Douglass,

In answer to name simply call it the lowell observatory . .

Percival Lowell,







Third, Lowell hired some remarkable astronomers who would give the observatory credibility in scientific circles. The first was Andrew Douglass (1867–1962), who helped Lowell found the observatory. Years after being dismissed due to his criticism of Lowell's scientific practices, he founded Steward Observatory and established the science of dendrochronology, both at the University of Arizona. The Slipher brothers, Vesto Melvin (V. M.) and Earl Carl (E. C.) spent their entire professional careers at Lowell. Both served as director at some point but are remembered mostly for their scientific contributions. V. M. (1875–1969) pioneered spectrographic techniques that allowed him to, among other things, measure the radial velocities of several so-called spiral nebulae, critical to unraveling the expanding nature of the universe. E. C. (1883–1964), on the other hand, was a pioneer of planetary photography and laid the groundwork for techniques such as image stacking.

Fourth, Lowell recognized, and located his observatory based on, the need for good atmospheric conditions and dark skies for optimal astronomical observing. In his book *Mars and Its Canals*, he wrote, "Not only is civilized man actively engaged in defacing such part of the Earth's surface as he comes in contact with, he is equally busy blotting out his sky. In the latter uncommendable pursuit he has in the last quarter of a century made surprising progress. With a success only too undesirable his habitat has gradually become canopied by a welkin of his own fashioning, which has rendered it largely unfit for the more delicate kinds of astronomic work. Smoke from multiplying factories by rising into the air and forming the nucleus about which cloud collects has joined with electric lighting to help put out the stars."

Not coincidentally, his chosen home from which to observe, Flagstaff, was in its early days nicknamed the Skylight City because of the brilliance of its stars against the dark background of sky. Thus was born the community's interest in dark skies, increased by the presence of Lowell and other observatories that were later established in the area. In the 1950s, at the prodding of Lowell astronomers, Flagstaff community leaders enacted the world's first legislation concerning light pollution, and in 2001 the International Dark-Sky Association recognized Flagstaff as the world's first International Dark Sky City.

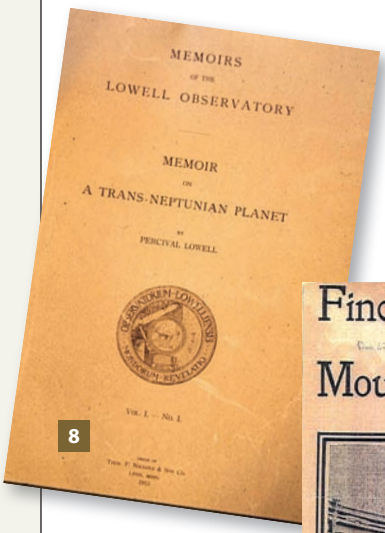
Far-reaching research

The next three contributions by Lowell focus on research programs that he started. First is the study of Mars, in support of his belief of intelligent life inhabiting that planet. Lowell was not the first scientist to observe the so-called martian canals — linear features on the planet's surface — and he was not the first person to suggest they indicated the presence of intelligent life, but he was certainly the most outspoken on this front, writing books and magazine articles and stimulating standing-room-only crowds with compelling speeches. Contrary to many popular accounts, Lowell and others who believed in the superficiality of the canals did not accidently mistranslate Giovanni Schiaparelli's term, *canali* (meaning "channels," a word implying of natural cause) to canals (implying artificiality). Rather, Lowell intentionally used the latter name to support his idea that some form of intelligent life had built them.

5. Lowell Observatory's 6-inch Clark refractor is set up for testing in Tombstone, Arizona, in 1894. LOWELL OBSERVATORY

6. One of the observatory's most important astronomers, V. M. Slipher, uses a spectrograph attached to the 24-inch Clark telescope to measure radial velocities of spiral galaxies. LOWELL OBSERVATORY

7. Another of the observatory's most influential astronomers, E. C. Slipher (right), with an assistant, taking pictures of Mars at Lamont-Hussey Observatory in Bloemfontein, South Africa, in 1956. LOWELL OBSERVATORY



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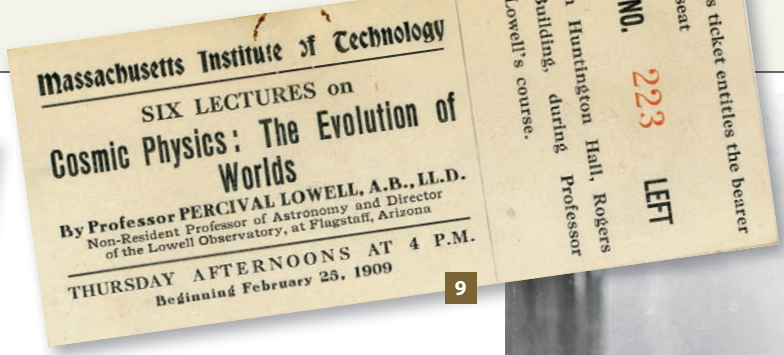

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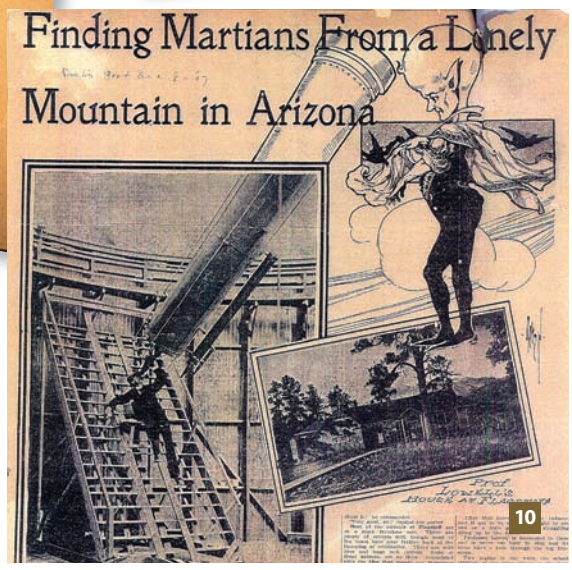

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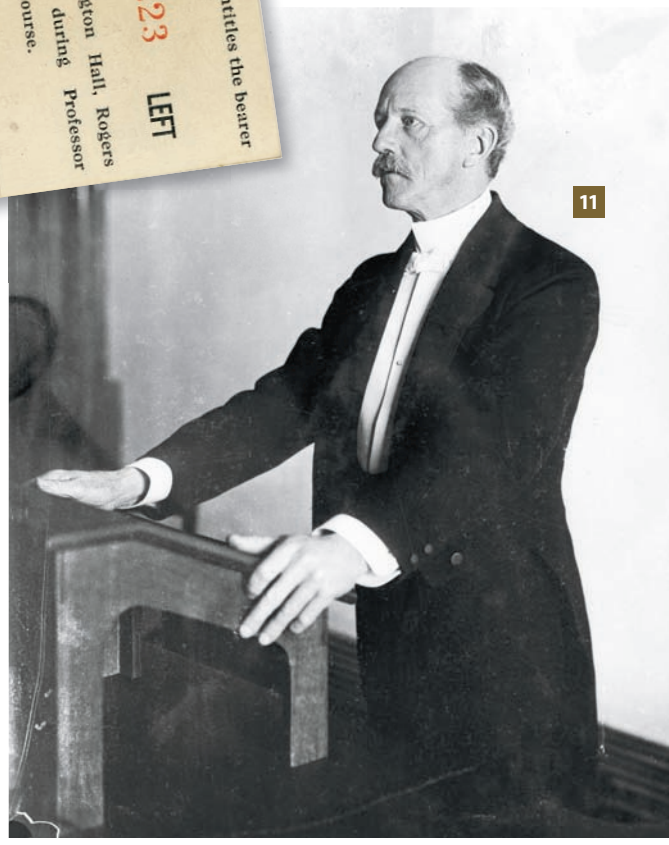

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8. Lowell's memoir about Planet X, published in 1915, in which he estimated the location of this hypothetical planet. LOWELL OBSERVATORY

9. A ticket from one of the many sold-out lectures by Lowell. LOWELL OBSERVATORY

10. One of many newspaper articles highlighting Lowell's ideas about the existence of life on Mars. LOWELL OBSERVATORY

11. Lowell speaking on Mars and other astronomical topics. LOWELL OBSERVATORY

Furthermore, Lowell did not speculate much on the exact nature of this supposed life, except that it would likely be much larger than that on Earth due to Mars' weaker gravitational pull. In his book *Mars*, Lowell wrote, "The existence of extra-terrestrial life does not involve 'real life in trousers,' or any other particular form of it with which we are locally conversant. Under changed conditions, life itself must take on other forms." With his research and popular accounts, Lowell built a consciousness about life in the universe. While most scientists dismissed his ideas, the general public remained intrigued, thanks largely to subsequent writers — particularly in the burgeoning genre of science fiction — and science popularizers who, often indirectly, built stories based on Lowell's ideas. Even today, many news stories about life or water on Mars include some mention of Lowell. Last year, for instance, in reporting about NASA's discovery of water on Mars, Flagstaff's newspaper, the *Arizona Daily Sun*, led with the headline "Was Uncle Percy right after all?"

Another research program Lowell started was V. M. Slipher's observations of spiral nebulae. Lowell believed these to be protoplanetary systems, and in his theory of planetology (the evolution of planets), the gases in these nebulae would eventually coalesce to form gas planets. Lowell thus directed Slipher to observe their spectra to see if they matched those of the gas giants like Jupiter and Saturn, which would prove the link between the nebulae and planets. The spectra did not match, but the exercise allowed Slipher to detect the incredibly high redshifts of the nebulae (which astronomers now identify as galaxies).

The third research program Lowell started was a search for Planet X, a hypothetical ninth planet. While astronomers later concluded that this planet, as defined by Lowell, doesn't exist (Lowell was looking for a large planet that was perturbing the orbits of Uranus and Neptune), it did lead to the discovery of Pluto 14 years after Lowell died.

In all three of these research programs, Lowell was fundamentally wrong or made assumptions that were inaccurate. Yet his conviction to carry out the programs led to other results and often to unexpected discoveries. Furthermore, by deciding on what research to pursue, without interference from outside concerns, Lowell set the standard by which the observatory would be operated, a legacy that continues today.

The last of Lowell's significant contributions was the popularization of science. He captured his sentiments on the subject in *Mars and Its Canals*: "To set forth science in a popular, that is, in a generally understandable, form is as obligatory as to present it in a more technical manner. If people are to benefit from it, it must be expressed to their comprehension." Soon after Lowell established his observatory, he invited Flagstaff residents to come and peer through the telescopes, and he became a popular speaker around the country. His engaging style captivated audiences and helped establish him as a promoter of science, a role at which many of his fellow astronomers scoffed. He was in many ways the Carl Sagan or Neil deGrasse Tyson of his time, a scientist who stepped into the spotlight to explain science.

Kevin Schindler *is historian at Lowell Observatory in Flagstaff, Arizona, and the author of several books about astronomy.*

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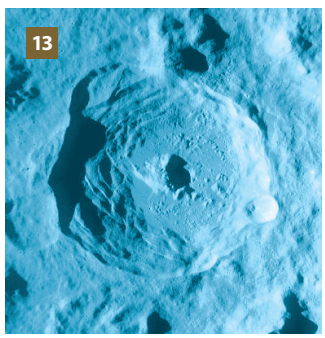
Lowell on Pluto



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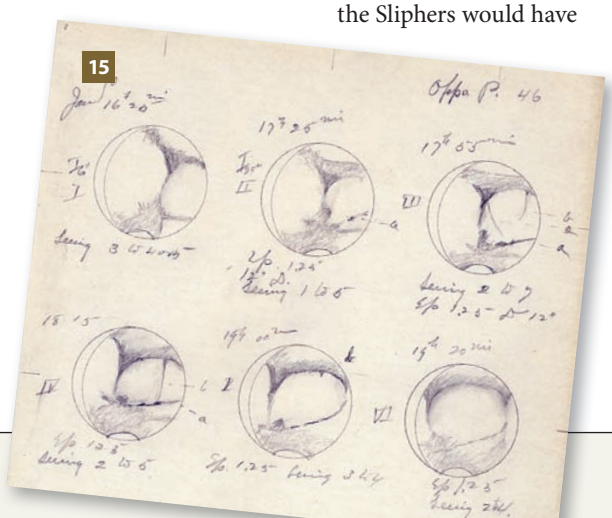
As a result of Lowell's efforts, the observatory later established education as one of its core mission components and through the years has reached millions of people during traditional on-site visits (97,000 people visited the observatory in 2015), through off-site programs (such as the Navajo-Hopi Astronomy Outreach Program, developed by astronomers Deidre Hunter and Amanda Bosh and now in its 21st year), and via media such as television, radio, and the internet (Disney, Sagan, Bill Nye the Science Guy, Leonard Nimoy, and many others have filmed educational programming at Lowell).

A wonderful life

So what was Lowell's impact on astronomy, given the benefit of a century of hindsight? If we try to imagine, in the spirit of George Bailey, what astronomy would look like today if Percival Lowell had never entered the field, Lowell's impact was substantial. Who knows what the science landscape of Flagstaff would look like? There would be no Lowell Observatory and likely no Flagstaff Station of the U.S. Naval Observatory, which was established in the 1950s largely because of the presence of Lowell. Beyond Flagstaff, Douglass likely never would have come to Arizona and thus not established Steward Observatory, which, along with Lowell Observatory, was critical to establishing Arizona as a center for astronomical studies — one that today brings in a quarter of a billion dollars annually to the economy.

Without Lowell, who knows where Douglass and the Sliphers would have worked, and what they would have studied? Without Lowell's direction, V. M. Slipher likely would not have mastered use of the spectrograph and detected the recessional velocity of the spiral nebulae. Astronomers would have eventually made these discoveries, but probably not for years. The same goes for Pluto. Without Lowell's searches that inspired the discovery of Pluto, this small body would not have been discovered until much later, perhaps not until the 1990s, and then possibly would not have been classified as a planet. In fact, the course of planetary research and the search for life in the universe would have played out much differently. In addition, Mars likely would not have been nearly as popular a topic for science fiction writers and, later, moviemakers. The list goes on, but these are a few of the more salient examples.



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Lowell craved the acceptance of his ideas by the fraternity of astronomers of his generation, but would never realize it during his lifetime. He was dismissed by many because of his apparent failings in the field, but his vision and conviction resulted in a number of exceptional discoveries and events that would fundamentally impact our understanding of the cosmos. In many cases, the results were unintentional. Yet intentional or not, they came about because of Lowell's characteristic take-action mentality and willingness to financially back programs in which he believed. Lowell wanted to make a positive impact in his field and had the conviction to follow through with his efforts, even in the face of occasional strong opposition. And with a century of hindsight, we can say that he achieved this goal and left quite an imprint on the field of astronomy.

12. The as-yet informally named Lowell Regio on Pluto (left-hand portion of the image), observed for the first time in the New Horizons flyby of Pluto in 2015. NASA/JHUAPL/SwRI

13. One of several solar system features named for Percival Lowell: Lowell Crater on the Moon. NASA/JPL/MSSS

14. Lowell Crater on Mars, also named for the astronomer. NASA/JPL/MSSS

15. Drawings of Mars made by Lowell. LOWELL OBSERVATORY