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WILLIAM HAMMOND WRIGHT

1871—1959

A Biographical Memoir by
C. D. SHANE

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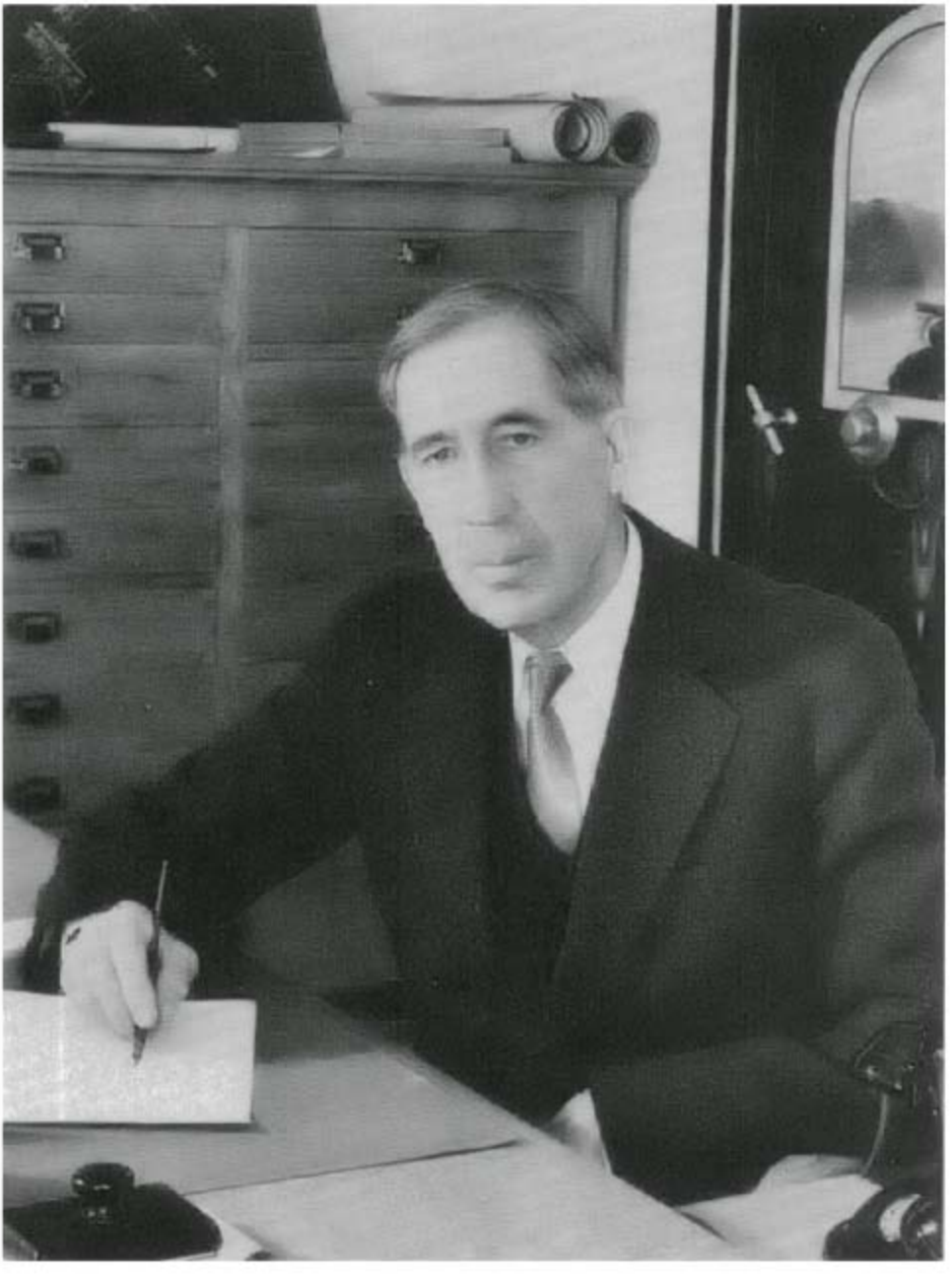

W. H. Wright

WILLIAM HAMMOND WRIGHT

November 4, 1871–May 16, 1959

BY C. D. SHANE

IN RESPONSE TO a terse telegram from Director Edward S. Holden—"Waiting for you. Seven hundred [dollars annual salary]. Answer when you will be here"—William Hammond Wright came to the Lick Observatory in August of 1897. The salary was better than he had anticipated, the scientific opportunity tempting, so as soon as he concluded his work at Yerkes Observatory, Wright left for Mt. Hamilton. He remained on the staff of the observatory for 47 years, serving as Director from 1935 to 1942.

Wright was tall and dignified in appearance, deliberate and quiet in manner. His whimsical sense of humor was sometimes as surprising as it was delightful. Although he had a lively imagination and his scientific work over the years covered a wide range of subjects, he was always able to concentrate effectively on the problem at hand until he brought it to a reasonable conclusion.

Wright was among the pioneers in the developing field of spectroscopy. He measured stellar radial velocities and observed the spectra of novae, gaseous nebulae, and comets. He did extensive color photography of the planets and organized an improved program for accurate measurement of the proper motions of the stars. He was skillful and resourceful in the design and use of instruments, making valuable contributions to the

improvement of spectroscopic equipment, and was himself a careful observer and sound interpreter of his observational data. So fortunate a combination of talents as Wright possessed is seldom found.

William Hammond Wright was the son of Selden Stuart and Joanna (Shaw) Wright. His parents, both Virginians, were members of distinguished southern families. His father graduated from William and Mary College in 1842 and came in 1860 to San Francisco, where he practiced law and later became a probate judge. His mother outlived Judge Wright by 26 years. She took an active part in the life of San Francisco and founded chapters both of the Colonial Dames and of the Daughters of the Confederacy. In a personal letter written in 1935, Wright paid tribute to his parents:

> My father was simple and charming in his manner and made hosts of friends. I think he did not know the meaning of fear. . . . While his professional life was successful, his real interest centered in his family. His devotion to my mother, and hers to him, was such that after nearly half a century I refer to it with diffidence as something too sacred to probe or disturb. To us, his children, he was affection itself, and we had his companionship during every moment that could be spared from his professional preoccupations: It was from him, in walks over hills and along streams, that we learned to love the world.

Wright was born in San Francisco on November 4, 1871, one of the younger of 12 children. He attended the public schools in San Francisco and then entered the University of California, from which he graduated in 1893 with a B.S. degree in civil engineering. This training and a subsequent course in shop work gave him certain technical skills that proved of great value in his later work with astronomical instruments. During two years of graduate work at the University, his interests turned more and more toward mathematics and astronomy. He wrote Holden asking that he be granted the privilege of studying astronomy at the Lick Observatory during the coming vacation. The request was approved and Wright spent the summer of

1895 on Mt. Hamilton. The next year he went to the University of Chicago and the newly established Yerkes Observatory. Here he had the good fortune to work with George E. Hale, who, as he noted in a letter, "treated me all along with the kindliest consideration." Hale's infectious enthusiasm no doubt turned Wright further toward the developing field of astronomical spectroscopy. W. W. Campbell had started to work in that field at Lick Observatory, and Holden invited Wright to come and work with him, which Wright did in the fall of 1897. Hale wrote to Campbell: "I am very sorry we are going to lose Mr. Wright.—I do not know when I have met a man who seemed to me so promising." Wright had accepted Holden's offer of $500 "if there is enough money." But matters turned out more favorably than anticipated, and on July 15, 1897 Wright was appointed assistant astronomer on the Lick Observatory staff at $700 per annum.

In 1901 Wright married Elna Leib, the daughter of Judge and Mrs. Samuel Leib of San Jose. Until his retirement, the Wrights made their home on Mt. Hamilton. There were no children.

During his first few years at Lick Observatory, Wright participated in the main observatory program, that of taking and measuring the spectrograms of a selected list of stars. He introduced several improvements in the instrumental equipment, in particular a new mounting for the spectrograph which materially decreased the flexure and consequently improved the accuracy of the measures. He also determined the orbits of a number of spectroscopic binary stars, observed the spectra of comets and of gaseous nebulae, and, with Campbell, made extensive observations of the brilliant new star, Nova Persei.

Wright continued his work at Mt. Hamilton until 1903 when he went to Chile as Acting Astronomer in charge of the D. O. Mills expedition. For a number of years Campbell had planned a temporary observatory in the southern hemisphere for the

purpose of extending the coverage of the sky for his radial velocity program. Funds were provided by Darius Ogden Mills, a California financier. A reflecting telescope of 36½ inches aperture, a spectrograph, and the metal parts for a dome were built and prepared for shipment. It was anticipated that Campbell would go to Chile to select a site and to initiate the program. But while testing the telescope just before shipment, Campbell was seriously injured, and the full responsibility for the expedition fell to Wright.

On February 28, 1903 Wright, Mrs. Wright, and Dr. H. K. Palmer sailed from San Francisco. They landed in Valpariso on April 18th at the beginning of a month-long strike of launch hands. During that time most of the Lick equipment remained on lighters in the bay. With great ingenuity Wright managed to get the telescope mirrors, weighing about 900 pounds with their packing, aboard a passenger rowboat and safely ashore. From Valpariso these went by rail to Santiago. When the strike ended late in May the remainder of the equipment was brought ashore and similarly forwarded.

Meanwhile Wright and Palmer had scouted for a suitable site, and they finally settled on the middle peak of Cerro San Cristobal, a ridge on the outskirts of Santiago rising about 1000 feet above the valley. As Wright wrote to Campbell, many compromises had to be made in selecting the site because of peculiar conditions that "did not bear on the observing, not the least the matter of bandits." This added some hazard to the daily climb to the observatory from Santiago where the Wrights and Palmer found homes. In addition to securing a site, Wright found it almost equally important to establish cordial relations with the many government officials, which he did most skillfully to the great benefit of the expedition.

The equipment arrived in Santiago late in May. The telescope had suffered only minor damage in transit, but the dome parts were so badly rusted that it was impossible to read the

markings that keyed their positions in the structure. Some parts had to be heated and reshaped. Here again Wright's mechanical skill and his ability to "make do" proved invaluable. Ground for the observatory was broken on May 27th. Despite constant frustrations and delays, the first observations were made September 11th. By the end of November the observatory was completed and had settled to systematic observations. Despite Wright's comment that "Chile is a poor place to rush a job," this was just over nine months after the expedition left California.

Wright remained in Chile for three years and laid a firm foundation for the observatory's continuance under a series of observers until 1926. During Wright's administration some 900 spectrograms of 250 different stars were secured of a quality quite comparable to those taken on Mt. Hamilton. The major portion of the observing was done by Wright, most of the measuring by Palmer. Although the observatory was initially planned for only a few years use, the dome and telescope, now owned and maintained by the Catholic University, are still operable, with apparently few changes since their installation. This attests to their sound design and construction.

Following his return from Chile in 1906, Wright was mainly occupied for several years in analyzing and preparing for publication the results of the expedition. During this period he also directed his attention to several problems, including the study of novae and gaseous nebulae which he later developed into major fields of research.

Including his early paper with Campbell on Nova Persei, Wright published twenty-three articles on novae during the period from 1901 to 1933. Observations of at least ten novae are recorded in these papers, all of which were directed toward a systematic description and an understanding of the very complex spectroscopic phenomena accompanying these stellar explosions. The spectrum of a nova undergoes a bewildering variety of changes from the time of its outburst until, as it grows fainter,

it comes to resemble that of a gaseous nebula with a faint hot central star. Wright's detailed descriptions and his classification of the various phases through which the nova spectrum passes have contributed greatly to current understanding of the nova process.

The spectra of novae are closely associated with the spectra of the gaseous nebulae. It was therefore appropriate that Wright should have investigated the nebulae, though there is no reason to believe that the one subject initially suggested the other. His first paper on the nebulae, in 1902, was a study of the wavelengths of some nebular lines. Eight years later he published another paper on the same subject, and his interest in the nebular spectrum continued until his final contribution in 1934.

The results of Wright's nebular work to 1918 were assembled in a monograph in the Lick Observatory Publications, Volume 13. Here he gives the wavelengths of sixty-nine lines, of which twenty-nine were believed to have been observed for the first time. The study included the stellar nuclei of the planetary nebulae which he found from their spectra to be very hot stars. Some contained emission bands characteristic of the Wolf-Rayet stars.

By means of photographs with a quartz slitless spectrograph which he designed and had built for the Crossley reflector, he was able to obtain spectra consisting of monochromatic images of the nebulae in the different spectrum lines. Some images differed markedly in size from others. The cause was not understood at the time, but it was subsequently shown to be due to the effects of temperature and density which depended on distance from the hot central star. With the quartz spectrograph, Wright discovered in nebulae the continuous spectrum which extends beyond the limit of the Balmer series of hydrogen. This continuous emission spectrum had first been observed by Evershed in the chromosphere of the sun.

Wright extended his observations as far as possible into the

previously unexplored regions of the spectrum. In the ultraviolet the efficiency of his quartz spectrograph was further enhanced by having the Crossley mirror aluminized, which was done at the Mt. Wilson Observatory. The higher reflectivity in the ultraviolet permitted observations to the limit of the atmospheric transmission.

When Wright started work on the nebulae, observations in the red portion of the spectrum were very difficult owing to the low sensitivity of commercial photographic plates in that region. He systematized the process, developed by R. J. Wallace, of bathing ordinary commercial plates in certain aniline dyes so as to obtain consistently clean and sensitive plates extending into the red. Later, with the introduction of a new dye, plates of very good sensitivity in the near infrared were obtained. Thus he was able to extend the discovery and measurement of nebular lines over the full range of wavelengths possible with these new techniques.

The favorable oppositions of Mars in 1924 and 1926 suggested to Wright that he might take this opportunity to use similar techniques in observing that planet over a wide range of colors. He photographed Mars with the Crossley reflector, using a microscope lens to enlarge the image formed at the focal plane. C. E. K. Mees of the Eastman Kodak Research Laboratory cooperated by having prepared for Wright's use special plates sensitized with red and infrared dyes.

Wright took many photographs in a spectral range extending from the ultraviolet to the infrared. He found that the surface features of Mars appeared with progressively increasing contrast toward the longer wavelengths. The only fixed markings that appeared in the violet were the polar caps, and he showed that these were atmospheric phenomena. The south polar cap as photographed in longer wavelengths was reduced to a small central white core which appeared to rest on the surface of the planet. The disc of the planet in violet light ($\lambda = 4400$) was

measurably larger than in the infrared ($\lambda = 7600$). This suggested that the diffused violet light surrounding the planet represented a scattering atmosphere about sixty miles in thickness. Wright carefully looked for possible sources of error in interpreting these measures and felt that this interpretation was correct. However, later investigators have suggested other causes that may have contributed to the observed effect.

Wright also noted and studied extensively both the well-known yellow clouds that appeared on Mars from time to time and the blue clouds that occurred on the violet photographs. In addition he observed certain other Martian atmospheric phenomena. He photographed Jupiter on sensitized plates and found striking differences between the violet and the infrared images, but contemporary knowledge was too limited to suggest any clear interpretation.

Twice Wright took part in solar eclipse expeditions. In 1923 he led the Lick Observatory expedition to observe the eclipse near Ensenada, Baja California. Unfortunately, cloudy weather prevented any observations. In 1932 he was a member of the expedition to Fryeburg, Maine, where he successfully photographed the solar corona with greatly improved equipment.

When in the second decade of the present century evidence accumulated that the spirals and certain other types of nebulae were separate stellar systems very remote from our galaxy, Wright's thoughts turned to using these objects in establishing a fixed coordinate system to which the motions of the stars could be referred. It has been customary to refer stellar motions to a system based on the average motions of large numbers of stars. This is satisfactory if the motions are entirely random, but if they are systematic, there is no assurance that the coordinate system is a truly inertial one. Systematic motions in fact do exist because of the rotation of our galaxy. Wright's plan was to photograph the accessible part of the sky at two epochs separated by several decades. The star positions would then be measured for each of the two epochs, using the small faint

galaxies as a framework of coordinates. From a comparison of the measures at the two epochs, the stellar motions could then be accurately determined.

Wright recognized that in order to pursue the project using external galaxies, it would be necessary to have a telescope that would photograph large fields of faint galaxies with reasonably sharp definition. With Frank E. Ross's design of large field astrographic lenses about 1920, the concept became a practical possibility. In 1934 the Lick Observatory obtained funds from the Carnegie Corporation to acquire an astrographic telescope of 50 cm. aperture and 350 cm. focal length. The lens was made by J. W. Fecker according to the design by Ross, and the mounting by the Warner and Swasey Company following Wright's general specifications. From the mid-thirties until he left Mt. Hamilton, Wright devoted the major part of his time and thought to planning and installing the telescope and organizing the program of observation. When he finally left the observatory in 1944, the telescope was essentially ready for use.

In 1947 observations on the program were started, and the first series of photographs was completed in 1954. Wright was present when both the first and the last plates of the initial series were taken. More than twenty years after the start of the first series, the second series was undertaken. The project in competent hands is now yielding results such as Wright looked forward to. It is a tribute to his imagination, foresight, and careful planning.

Wright served as Director of the Lick Observatory from 1935 until 1942, when he retired at 71, well past the normal age for retirement. He continued two years more as astronomer. During his directorship he greatly strengthened the staff of the Observatory through the addition of several young astronomers who later attained eminence in their fields.

Wright's astronomical work was interrupted very briefly at the time of World War I. Although by temperament he was in no way inclined toward a military life, he had a very strong

sense of duty toward his country. In the summer of 1916 he attended a Citizens Training Camp in Monterey, and later he applied for a commission in the Coast Artillery. In the fall of 1918 he went to the Aberdeen Proving Ground in Maryland where he was commissioned a Captain of Ordnance. He had served only a month when the war ended, and early in 1919, after an honorable discharge, he returned to the University. He taught briefly in Berkeley, and returned to the Lick Observatory on June 30th of that year.

From childhood Wright had a keen appreciation of nature and the open country. It is fortunate that his life work was in so congenial a setting as Mt. Hamilton. He walked in the back country and during his earlier years he enjoyed deer hunting. He often found a solitary trail more conducive to scientific thought than his desk, and on occasion he advised a student to think out some knotty problem on a quiet hillside. For many years Wright was an active and enthusiastic member of the Sierra Club. He took part in many of their summer trips and independently camped over a wide area of the California mountains. In 1925 he was appointed a Director of the Sierra Club and he was an honorary Vice-President until his death. Throughout his life he battled to save the National Parks from exploitation. A letter to the Secretary of the Interior, written in 1950, said in conclusion: "I am anxious that Americans may continue to experience the delight of solitude in the wild places."

Wright had a strong, indeed an almost quixotic sense of justice. This is exemplified in a letter he wrote to the Regents of the University in 1932, during the depression years. He had been advised of a salary advance of $500 a year and while expressing gratification, he asked that his salary be continued at $5500. He replied in part:

> In view of the present distressing economic situation I certainly had not anticipated a raise in salary, and after a few moments of reflection I feel quite sure that it would make me uncomfortable to accept one. What with

the shrinkage of incomes of substantially everyone, and the voluntary acceptance of reduced compensation by workmen and other wage earners all over the country, the time hardly seems opportune for salary increases. I feel we should consider ourselves lucky in the maintenance of the status quo.

With difficulty the University finally persuaded him to accept the increase.

He held strong opinions on political and international matters involving moral questions. Subsequent to World War I he was a member of the Save-the-Children Federation and contributed to the support of an adoptive child. Always an advocate of universal military training, he wrote frequent letters to members of Congress urging his viewpoint. Much of his time after retirement was spent in an attempt to arrange an adequate University pension system. Although he shared in the benefits of this, his interest and strenuous efforts were certainly in large part due to his dedication to righting a wrong. Meticulous in assigning credit for scientific work to his colleagues, he expected the same consideration in return.

Wright had three degrees, a B.S. from the University of California (1893), a D.Sc. from Northwestern University (1929), and an LL.D. from the University of California (1944). He commented: "The first was much harder to get."

He was a member of several societies, Phi Beta Kappa, Sigma Xi, the National Academy of Sciences (elected in 1922), and the American Philosophical Society (elected in 1935). He was also a Foreign Associate of the Royal Astronomical Society which awarded him its gold medal in 1938. He received the Janssen Medal of the French Academy in 1928 and the Henry Draper Medal of the National Academy of Sciences the same year.

During the last years of his life, Dr. and Mrs. Wright lived in their San Jose home. He died on May 16, 1959 at the age of 87. Perhaps his career may best be summarized in his own mod-

est words: "Since graduating with the class of '93, I have been doing largely what came next."

THE PRIMARY SOURCE of information for this memoir was the unpublished letters, both to and from Wright, as well as Wright's published papers, in the Lick Observatory Archives. For his family background I consulted material in the Library of the California Historical Society in San Francisco and the State Library in Sacramento. I was closely acquainted with Wright for forty years and much of the content of the memoir is based on personal knowledge.

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