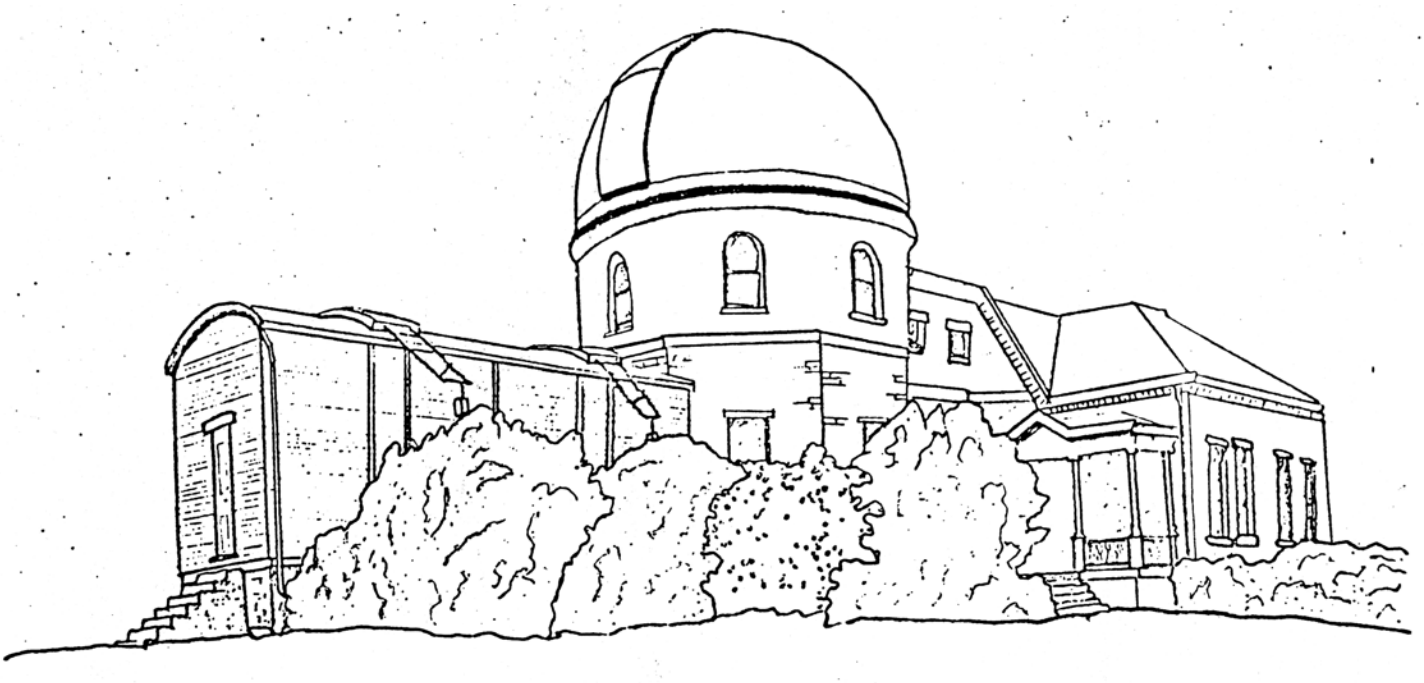
EMERSON McMILLIN

and

HIS ASTRONOMICAL OBSERVATORY



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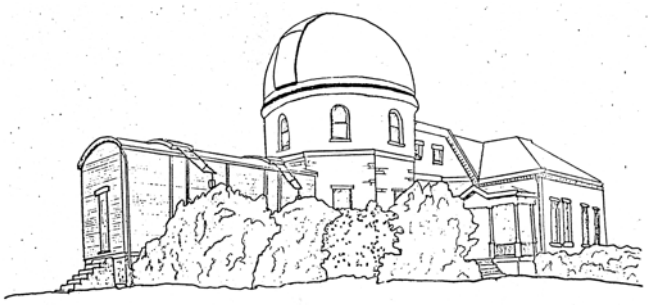

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In this day of giant land-based and earth-orbiting telescopes, deep space probes, and radio arrays, the smaller astronomical observatories of yesteryear have fallen into disuse and disrepair. Many have been abandoned or torn down. Modern electronic imaging systems can gather a broader range of light along the spectrum from dimmer objects than was anticipated by generations past. Many modern amateur astronomers have telescopes that rival and even surpass the telescopes housed in even the most advanced professional observatories around the turn of the century.

The most modern and sophisticated amateur astronomer possesses optical imaging systems that far outdo equipment available to the professional observer even a few decades ago. Major observatories are in remote, mountain-top observing sites with their thin air and dark skies. Amateurs can easily transport their equipment to such locations, while the older observatories languish under the city's brightly lit skies. With all these advantages, however, modern observers and equipment don't totally eclipse the smaller optical observatories' accomplishments that were the backbone of astronomical research only a generation or two ago.

When the many smaller observatories were constructed in this country around the end of the 19th century, many were high up on the list of "large" observatories. Regardless of what would today be considered their "small" size, much valuable pioneering work was begun that made much of today's more advanced work possible. Many of these observatories were undertaking research pushing back the frontiers of the science of astronomy in that day. Fundamental work in spectroscopy, photography, and photometry was performed with telescopes whose apertures were on the order of 12 inches in diameter – tiny by modern standards.

To understand the importance of the work initiated by these small observatories and the value of their contribution to our understanding of the cosmos, we must look at the state of astronomy at the turn of the 20th century. At this time, the structure of the Milky Way was not yet clearly understood, and galaxies beyond our own had yet to be recognized as such. A logical method of the classification of stellar spectra was not yet complete, and the nature of stars was not yet fully understood. The source of the stars' enormous power was yet to be guessed at, and the great age of the Earth and heavens was not perceived.

Astronomers were not sure how the universe could hold together given gravitational influences and how the universe might avoid a heat death. Some astronomers were contemplating life on other worlds, and others suggested that the firmament was the location of a corporeal heaven.[1]

The cataloging of the solar system's asteroids and moons had just begun. By 1890, just over 300 asteroids were known to exist, and the first significant efforts were being made to accurately catalog stars and their positions. The rules of

[1] See for instance, Porter, J. G. (1888) *Our Celestial Home: An Astronomer's View of Heaven,* New York: Anson D. F. Randolph & Company.

gravity were still being worked out to explain the motion of the moon and planets and the solar system's stability. Spectral laws were discovered by a few enterprising European scientists but not yet explained. Helium was only lately discovered, and no one had yet heard of Einstein or the Bohr model of the atom. Astronomy was eminently practical, and much work revolved around direction finding and establishing location upon the Earth's surface using the sun, moon, and stars as aids.

Astronomy had been the subject for the naked eye and a few relatively imprecise measuring instruments until Galileo and others turned the telescope to the heavens in 1609. Even so, Copernicus made observations, which allowed him to determine the relative sizes of planetary orbits using mathematics and limited observations. Kepler had used the observations of Brahe to lay down the laws of planetary motion. Only after the telescope's invention did proof positive come to light for the belief that the Earth was just another planet orbiting around the sun. In the intervening years, astronomers observed and recorded what was seen, searched for cornets and asteroids, and predicted planets' motions based upon the newly discovered laws of Newton's gravitation.

Up through the turn of the 20th century, the lot of the professional astronomer was uncertain. Frequently, the astronomer served a patron who provided both equipment and salary for the solitary laborer of the sky. The astronomer's time was often split between making useful observations and calculations and preparing astrological horoscopes.

With the disappearance of patronage and a clear indication of the practical use of astronomy in navigation, timekeeping, surveying, etc., more advanced countries established national observatories staffed by a hand full of astronomer/mathematicians. Top universities usually possessed a chair of astronomy and only one or two astronomers to assist the professor in his research. Worldwide there were only a very few astronomers per se. Budgets for university observatories were usually small, rarely providing sufficient resources to maintain the equipment or pay for persons to perform lengthy and time-consuming hand calculations.

Toward the middle of the 19th century, a wave of observatory building spread across the U.S. Before this time, only a few telescopes, imported at high cost from Europe, dotted the landscape and were often owned and operated by wealthy individuals who worked successfully as astronomers. In 1825, President John Quincy Adams told Congress that, as an American, he was not proud that while Europe had over 130 observatories, there was not a single public observatory throughout the whole of the American hemisphere. By 1840, eight public observatories had been erected in public institutions. In 1844, the Cincinnati Observatory was opened to the public, being as it was built entirely of public funds. It housed the largest telescope in America at the time – 11.5 inches clear aperture. Mr. Adams was successfully prevailed upon to speak at the observatory's comer stone laying ceremony, so important was the event perceived to be.[2]

The expanding development of the Midwest was the advent of several new observatories. The Chicago Astronomical Society installed an 18-inch telescope in 1865 (which later become the property of Dearborn Observatory). In 1895 alone, four major Midwestern universities saw fit to establish astronomical observatories and house them with powerful telescopes: the Ohio Agricultural and Mechanical College (later The Ohio State University) – 12.5 inches; the University of Pennsylvania – 18 inches, the University of Illinois – 12 inches, and the University of Minnesota – 10 inches.[3]

A few larger observatories were to be built within the next few years, such as the Yerkes Observatory of the University of Chicago at Williams Bay, Wisconsin. Other facilities included Lick Observatory of the University of California and the Harvard College Observatory. Such extensive facilities were paid for by wealthy individuals to honor institutions in the cities where they had been born or had gone to school, or as monuments to themselves or others.

Many smaller but notable observatories were established by less wealthy, by equally generous and well-intentioned individuals. One such observatory, the one at Ohio State University at Columbus, no longer stands. The history behind the observatory is the story of one man's unwavering interest. The story beings with the man the observatory bore – Emerson McMillin.

A YOUTH GROWS UP

[Osirus] Emerson McMillin was born April 16, 1844, in Ewington, Gallia County, Ohio. He was the son of William Reid and Nancy (Butler) McMillin. Emerson (he never seemed to like his given name Osirus) was the great-grandson of James McMillin, who migrated from Scotland and settled in Virginia sometime before 1765.[4] He was the 12th of 14 children that would eventually fill the McMillin household.[5] (Refer to Appendix 1 for details about McMillin's life.)

[2] Goldfarb, Stephen, "Science and Democracy: A History of the Cincinnati Observatory, 1842-1872," *Ohio History,* Vol. 78, No. 3 (Summer 1969) Columbus, Ohio, Ohio Historical Society.

[3] Svec, Michael T., *The Astronomical Observatory of the University of Illinois,* an unpublished treatise, 1987.

[4] "A Leader of Modern Industry" by Arthur Goodrich, *The World's Work,* Vol. 2, No. 5 (September 1901), pg. 1201 and *National Cyclopedia of American Biography,* Vol 24, p. 170.

[5] Weed, J. M., "The Doomed Dome," *The Columbus Dispatch Sunday Magazine,* June 23, 1974, p 21.

Like many children of his time, Emerson went to school three months each year. He did so until he reached the age of 10.[6] One month after his 10th birthday McMillin left the one-room schoolhouse where he was to receive his only formal education.[7] While in school, Emerson was captivated by what he had learned, and, subsequently, books were at his side ever after. He was introduced to and intrigued by chemistry and geology, both of which would play a significant role throughout his life and lead to an amazing career.

Departing school for work, McMillin was employed first as a manual laborer at an iron foundry where his father was manager.[8] He received 25 cents per day for back-breaking labor to stoke and bank the furnaces.[9] During the winter months, he participated in gathering wood to make charcoal, which was used to stoke the furnaces. Each shift in the factory and field was twelve hours long. The strenuous work made him muscular, and it was claimed that he could "lift 600 pounds at a test." It was said that Emerson was the best wrestler of all of Gallia and adjoining counties.[10] He was well-liked because of his youthful energy, good humor, and adult mannerisms.

Even though McMillin had picked up his shovel, he hadn't lain down his books. He always found time for independent study.[11] Of primary interest were the chemical processes which surrounded combustion and the smelting of iron. In the foundry, McMillin acquired an interest in glowing bodies, an interest that in no small way would pave a path to the construction of the astronomical observatory named in his honor. His knowledge, experience, and enthusiasm (and father's position, no doubt) provided him opportunities not afforded to others. Within two years, at the age of twelve, Emerson was put in charge of boilers and steam engines at the foundry where he worked.[12]

By the time Emerson reached 14 years of age, his duties included oversight of charcoal production from wood.[13] At this time, charcoal was used in the smelting of iron ore, and charcoal production was of prime importance. McMillin was now shouldering more responsibility and earning more as a result. He became increasingly interested in combustion chemistry. At 16 years of age, McMillin devised a way of successfully producing more charcoal at no additional cost.[14] He designed, built, and operated all the equipment needed for the new process, which increased the yield of charcoal by 25 percent.[15] As a result of this successful new technique, McMillin was awarded a prize by the company. Within a few years, McMillin had moved from laborer to charcoal burner to engineer – rapidly mastering the fundamentals of iron manufacturing and learning the worth of a good education and hard work in the process.

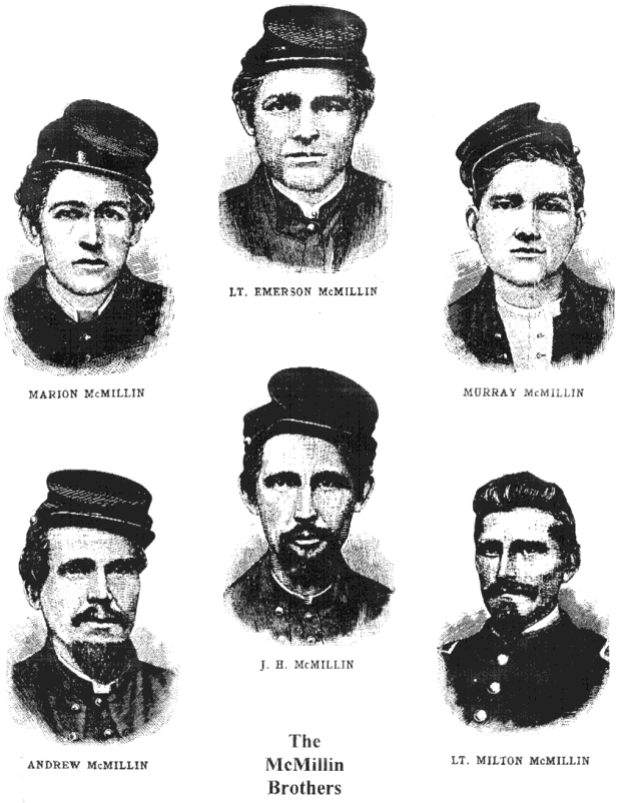

Figure 1. The Fighting McMillins

In 1861, when McMillin was 17, he heard Lincoln's call to arms. Six of McMillin's older brothers responded to that call, and Emerson chose not to remain behind even though he was already making significant progress climbing the ladder of success. He attempted to enlist but was denied entry into the military because of his age. Like so many other youths of that period, he aged a year overnight and was accepted into the 18th Ohio Infantry Regiment.[16]

A few weeks after enlisting, he was nearly killed while on guard duty at a railroad bridge when a passing locomotive almost ran him over. After three months in the military, McMillin's unit was reorganized as the 2nd West Virginia Cavalry. As part of this unit, McMillin saw action in the Sinking Creek Raid, where he was wounded.

[6] *The World's Work,* p 1201
[7] *History of Ohio State University,* 1870-1910. Vol. 1, 1920, University Press, by Pollard, p 432 and National Cyclopedia, Vol. 24, p 170.
[8] Pollard, 432
[9] Ibid.
[10] *The World's Work,* 1201
[11] Pollard, 432
[12] Weed, 21
[13] Pollard, 432
[14] Ibid.
[15] *The National Cyclopedia of American Biography,* Vol. 24, 170, James T. White & Co., Chicago, 1935.
[16] *The World's Work,* 1201

Emerson and five of his six brothers were known to his hometown acquaintances as "The Fighting McMillins." (Lt. Emerson McMillin is shown at the top center of Figure 1.) Three of Emerson's brothers were killed in battle or later died of wounds. Emerson himself was wounded several times over the course of the war having participated in 38 battles.[17] Twice he was offered a commission in the officer corps, but he chose to turn these down.[18] At the end of the war, he was mustered out as a Lieutenant.[19]

His time in the West Virginia mountains was in some ways fateful. During this time, he made astronomical observations while standing guard duty at night.[20] The stars, he reasoned, were glowing bodies just like embers of charcoal. He noted that stars came in various colors, which had something to do with their temperatures. He was intrigued by the prospect of understanding these bodies and spent his spare time learning more about astronomy, in addition to chemistry and geology. In his soldier's knapsack, he always carried with him three books, one on each of the subjects in question.[21]

At the age of 21, having left behind a successful military career,[22] McMillin returned not to the furnaces that employed him before his departure but to business. McMillin had with him some money from pay and bounties. He invested some of this money in "country storekeeping," which ultimately failed.[23, 24] After storekeeping, he became a traveling shoe salesman, which again proved unsuccessful.[25] Next, he tried the coal business, also with similar results.[26]

After the coal business, McMillin took a job as a manual laborer, participating in constructing a small gas works at Ironton, Ohio.[27] It was here, at this little outpost on the Ohio River, that McMillin would meet his wife to be, Isabel, and laid the groundwork that would catapult him to the top of a financial empire a few years later. Isabel was the daughter of Mortdecai Morgan of Wales. From this bond, McMillin would eventually have five children: Mary, Estelle, Maud, Emerson, and Marion.[28] His work constructing the gas works would be no less fruitful.

After completing the Ironton gas works in 1869, McMillin was appointed superintendent of the facility because he had demonstrated so much knowledge of gas chemistry.[29] Yet, he wished to know more. He installed a laboratory in which he pursued the study of gas chemistry. Every spare minute of the day and often late into the night, he worked on the science of gas purification and enhanced production methods. He often began work at 7:00 a.m. and concluded his work after 2:00 a.m.[30] His studies resulted in the invention of a method for the purification of natural gas in large quantities.[31] The technique called for passing the gas through filters of sand and metal filings.[32] What McMillin accomplished through this process had "probably done more to place that business on a scientific and profitable basis than any other individual."[33]

McMillin read many hours each day, especially to improve his knowledge of geology. With this knowledge, he eventually pointed out stone formations wherein the Finley Gas Fields were found.[34] McMillin demonstrated that through study, hard work, and application of what he had learned, he could obtain managerial positions of responsibility not common to men of his age and background.[35] His reputation as an intelligent, inventive, and determined young man spread by word and writings, which ultimately opened new windows of opportunity in a rapidly industrializing world.

By 1875, McMillin once again had turned his attention to iron production.[36] Between 1875 and 1883, he became manager and president of several iron and steel works situated in the Ohio River Valley.[37] (Lawrence Iron Works, Crescent Iron Company, and the New York and Ohio Steel Co., to name but a few.) He did this without ever leaving his position as manager at the Ironton Gas Works.

During this time, McMillin was called in to preside over the fiscal chaos of the Columbus Gas Works. He introduced cost cutting measures and scientific methods for producing a cheaper, cleaner-burning gas.[38] These economies benefited the consumer directly, which ultimately brought the company higher profits. He turned a floundering company into a highly successful company using creative management techniques, which included the introduction of workplace rules, the awarding of bonuses, profit sharing, and turning over stock to employees as part of their pay.[39]

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[17] For details about McMillin's military career, see *The World's Work*, 1201
[18] Ibid.
[19] Cyclo, 170
[20] Pollard, 433
[21] WW, 1201
[22] Cyclo, 170
[23] Ibid.
[24] WW, 1202
[25] Ibid.
[26] Ibid.
[27] Ibid.
[28] Cyclo, 171
[29] Cyclo, 170
[30] Pollard, 433
[31] Cyclo, 170
[32] WW, 1202
[33] "Emerson McMillin on Business and Investment," *The World's Work,* Vol. 35 (Nov 1917), pg 16. (published by Doubleday, Page, and Co., Garden City, NY)
[34] WW, 1202
[35] WW, 17
[36] *Who Was Who in America,* A. N. Marquis Co., Chicago, Vol. 3, 1903-05, page 821 (also 969)
[37] Cyclo, 170
[38] WW, 1203
[39] Ibid.

Figure 2. Emerson McMillin

McMillin even turned potentially damaging business failures into successes. He once personally underwrote a $200,000 loan for a business he had been called in to manage.[40] The steel plant eventually folded. By personally paying off the bad loan and not simply writing it off, McMillin received credit far in excess of any of his assets.[41]

McMillin's experience, reputation, and backing in his work permitted him to extend his financial reach considerably. In 1888, he became President of the Columbus Gas Works where, with financial support, he became principal owner.[42] He subsequently obtained possession of several other gas works throughout Ohio.[43] He bought up the Sioux City Gas Works, improved upon it, and sold it at a considerable profit.[44] During this year, he had two chapters published in *Economic Geography* prepared by the Ohio Geological Survey.[45] In 1889, he bought up four competing gas companies in the St. Louis area and consolidated them into the Laclede Gas Company after considerable political turmoil.[46, 47] These successes earned additional financial backing for McMillin for projects of a similar nature.

Whenever McMillin could find the time, he studied banking and began to invest his capital not only in real estate but in stocks, bonds, and securities.[48] In 1891, he started the New York banking firm of E. McMillin and Company.[49] It was housed in The Equitable Building at 120 Broadway, just blocks from Wall Street, and was established for general banking purposes.

Figure 3. The Equitable Building at 120 Broadway in New York City

The success of the firm was "immediate and far-reaching.[50] By 1901, McMillin found himself atop a vast financial empire. He was in firm control of 40 public utility companies, was president of over 60, and head of a banking firm with assets in excess of $40 million.[51] From New York, McMillin's financial power and influence extended across the nation.

THE McMILLIN OBSERVATORY

Now a well-to-do native Ohioan, McMillin became an early benefactor of the Agricultural and Mechanical College of Ohio (later renamed The Ohio State University). One night early in 1895, while on one of his numerous trips from New York to oversee his investments and perform other duties, McMillin happened to find himself seated at the Columbus Club next to Julius F. Stone (1855-1947). Stone was an avid amateur astronomer and a friend of the College.

Figure 4. Julius F. Stone

McMillin's intellectual interests ranged widely, as did the conversation. During the discussion, their mutual interest in astronomy came up. The subject of the sun's nature and its composition and structure were discussed. The subject of observatories also came up. Stone mentioned that just that year,

[40] WW, 17
[41] Ibid.
[42] WW, 1203
[43] Cyclo, 170
[44] WW, 1203
[45] Weed, 22
[46] Cyclo, 170
[47] WW, 1204
[48] WW, 1203
[49] WW, 1204 and Cyclo, 170
[50] Cyclo, 170
[51] Cyclo, 170 and WW, 1205

the College had attempted to establish an observatory, but that the project was put off due to the cost. McMillin inquired as to the price of a moderate-sized telescope. The question went without answer.

The need to erect an astronomical observatory suitable for instruction in practical astronomy for civil engineers was deemed necessary by the School of Engineering in 1891. Through the initiative of Henry Curwen Lord (1866-1925), assistant professor of mathematics,[52] a motion was brought before the College's Board of Trustees to construct a small observatory on campus and outfit it with modest but modern equipment. Lord – son of prominent Cincinnati railroad magnet Henry Clark Lord (1826-1844) – had studied astronomy at the University of Wisconsin, having worked at Washburn Observatory, and had received practical experience in astronomical observations while working as an aide for the U.S. Coast and Geodetic Survey earlier.

Figure 5. Henry Curwen Lord, first director of McMillin Observatory. Image credit: The Ohio State University Libraries

The Trustees resolved to satisfy the need, and on July 22, 1891, they approved an expenditure of $3,000 from funds received under the new Morrell Act to establish the observatory. Lord was put in charge of the construction. Only one month later, the planning for the observatory and the purchase of instruments was suspended, "the funds being insufficient to justify the expense." For the time being, the hope of establishing an astronomical observatory had died, but they would be resurrected four years later by the chance conversation between McMillin and Stone.

Shortly after his return to New York, McMillin wrote Stone asking him to estimate the cost of construction and complete equipping of an astronomical observatory suitable to the needs and conditions at Columbus. Stone related to Lord information about the earlier observatory proposal. Goals relating to instruction and research had already been established. With McMillin's approval, a search was immediately undertaken to see what sort of suitable instruments could be obtained to carry out the work. Cost estimates were made for the construction of an observatory to house a 10-inch aperture refracting telescope. It was then discovered that John A. Brashear of Pittsburgh had a 12.5-inch diameter objective ready for immediate use. McMillin quickly consented to the increase in aperture and the additional cost, which would ultimately make his observatory the largest and finest in Ohio. The 12.5-inch instrument would surpass in size the telescope housed in the Loomis Observatory in Hudson (the oldest and largest observatory west of the Allegheny Mountains when it was built at Case Western Reserve Academy in 1837) and that of the Cincinnati Observatory (whose instrument was the largest in America at the time it was completed in 1844).

When final agreements were made for the main telescope's cost and a host of auxiliary equipment, final estimates were sent to McMillin.[53] Shortly after that, McMillin addressed a formal offer to the Board of Trustees, that came before that body at the meeting of April 10, 1895. The proposal was to provide for the equipping of an astronomical observatory per the quotes received. A cap on expenditures was set at $10,000 along with the stipulation that the Board "make such rules for the government of the observatory as will permit the public to have an occasional peep at the 'Milky Way'." The Board immediately accepted the offer and resolved that the building and equipment be designated the Emerson McMillin Observatory. (This made the building only one of three to be named after living individuals up to that time – Hayes, Orton, and McMillin.)[54] Architectural plans were to be drawn up by Professor J. N. Bradford.[55]

A motion was then passed authorizing President Scott, the Secretary of the Board, and Professor Lord to travel to various observatories to examine their equipment and select and purchase the needed equipment.

At the next meeting of the Board on May 9th, the Secretary presented another communication from McMillin in which he offered another $5,000, this time for the construction of the

[52] b. Cincinnati, OH, April 17, 1866, the son of Henry Clark and Eliz Burnet (Wright) Lord, OSU 1884-87, BS; U of Wis 1889. Assistant Prof of math and astronomy, 1891-1894, assoc. prof of astronomy, 1894-1900; prof 1900. Director observatory 1894-1923, Fellow of the Royal Astronomical Society. Appointed instructor of the US Army School of Military Aeronautics at OSU in May 1917. *Who Was Who in American History - Science and Technology,* p 369

[53] Original invoice lists the following items and costs: mounting, $3,600; objective with cell, $1,900; 3" finder, $50; six eyepieces (1 for finder) @ $5 = $30, four eyepieces for micrometer @ $5 = $20, one helioscope, $50. Invoice dated March 14, 1896 from Warner and Swasey.

[54] Pollard, J. E., *History of OSU, 1873-1948,* p 119

[55] Lord, H. C., The Spectroscope of the Emerson McMillin Observatory, *Ap.J.,* 50, (1896), pp 50-53

observatory building. The offer stipulated that the observatory must be located upon a ridge to the northwest of Columbus, above a valley that tradition says clinched the original campus location. He included a similar amount for establishing a botanical garden in the valley to the north of the facility, which would ultimately house a spring and pool known as "Mirror Lake." With this second act of generosity, McMillin guaranteed the completion of the entire observatory and provided for a lush setting.

Figure 6. McMillin Observatory on Knoll above Mirror Lake. Image credit: Grandview Height/Marble Cliff Historical Society.

In the meantime, Professor Lord, overseeing the selection and purchase of the various astronomical instruments, had been visiting several other observatories and makers of astronomical instruments. As a result of his visits and investigations, it was reported at the June 10th Board meeting that contracts had been let for the 12.5-inch telescope optics with Brashear of Pittsburgh, with Warner and Swasey of Cleveland for the mount and telescope assembly, and with G. N. Saegmuller of Washington, DC, for a 3.5-inch transit telescope with accessories.[56]

The following day, bids for the construction of the observatory building were opened. All were rejected as being excessive. The Board Secretary was then ordered to contract with a person or persons who would undertake the facility's construction as outlined in the guidelines for the construction and at a cost within the offer's constraints. At this meeting, the Trustees appointed Professor Lord director of the Emerson McMillin Observatory, and conferred upon him the university rank of associate professor of astronomy in the College of Engineering.

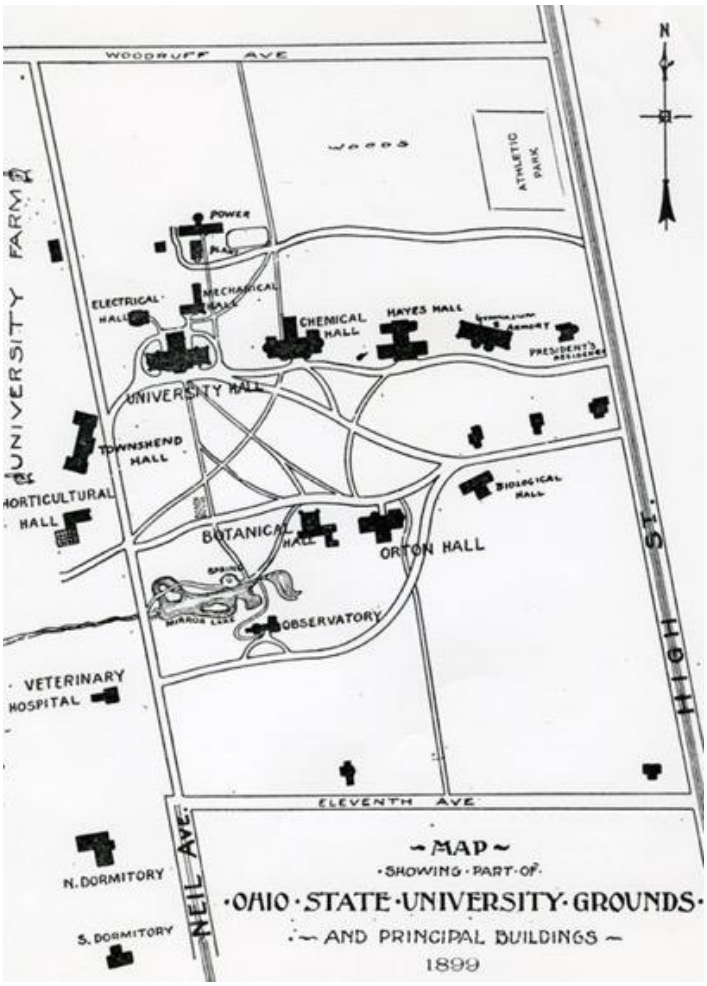

Figure 7. An 1899 campus map showing location of Observatory relative to Mirror Lake that clinched the location of McMillin Observatory.

Erection of the building by Pachard Construction and installation of the instrumentation was nearly complete by the end of 1895. At this time, the telescope's optics were tested by Professor James E. Keeler, director of the Allegheny Observatory at Pittsburgh, who declared them "satisfactory." The facility was "the finest equipped observatory and largest telescope in the state at the time of its construction."[57] The final cost of the fully-outfitted observatory was approximately $16,000.

[56] A second Fauth astronomical transit of 3-inches aperture was later added at a price of $1,050. A spectroscope by John A. Brashear was also added later at a cost of $1,195.50.

[57] McMillin Observatory, *The Columbus Dispatch,* June 12, 1896.

Prior to the dedication of the observatory, Edwin Foster Coddington (1870-1950) was hired as a "janitor" for the observatory at the rate of $240 per year. As the record notes, "In setting up and adjusting the equipment, Coddington became thoroughly familiar with it, more so, even, than Professor Lord."[58] Coddington went on to earn his B.S. in Civil Engineering from OSU and then a Ph.D. in Astronomy from the University of Berlin in 1902. After this, he returned to OSU as a professor of geodetic engineering where one of his interests was the use of the sun and stars for the purpose of surveying.[59] He would accompany Lord to Hawaii in 1910 for the purpose of viewing the effect on the solar spectrum of the transit of Halley's Comet over the face of the sun. Unfortunately, the sky was cloudy and the mission unsuccessful.

Figure 8. Edwin F. Coddington (1899) Image credit: University of California Santa Cruz Special Collections.

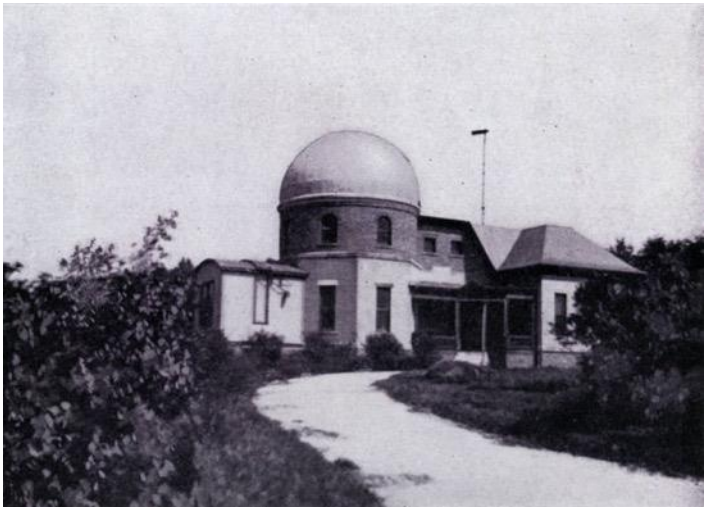

Figure 9. McMillin Observatory as originally constructed.

Figure 10. McMillin Observatory Postcard, perspective 1. Note second transit room added to the west of the original transit room.

Figure 11. McMillin Observatory Postcard, perspective 2.

Figure 12. McMillin Observatory Postcard, perspective 3

University catalogs of the period described the observatory as follows: "The first floor is divided by a hall and stairway into two parts: The eastern wing contains an office, library, clock room, and large, well-lighted room for students, furnished with tables, where they reduce their observations and keep the records of their work. The western wing contains the transit house, and in

[58] Weed, J. M. Unpublished manuscript, *The College of Engineering in the First Hundred Years of The Ohio State University*, September 1969.

[59] See "Azimuth Determination," *OSU Studies Engineering Series*, Vol. II, No. 5, September 1933. Bulletin No. 79.

the second story, the dome and photographic darkroom. The transit house is a light, frame structure, so designed to be kept as free as possible from heat radiated by any heavy walls of masonry. The dome is a wooden frame covered on the outside with canvas. The rest of the building is of wood frame covered with a gray pressed brick, the foundation and the second story being 'rock-faced'."

In one of his publications, Lord described the facility as follows. "It is built of gray pressed brick, rock-faced in the second story, and contains an office, library, classroom, clock room, dome, dark room, transit house, hallway two closets, and a large basement. The entire carpenter work was made by our college carpenter, Mr. Woodruff, and the patterns for the dome mechanism by the students at the university. This far, everything has given entire satisfaction."[60]

While working to equip the observatory, Lord kept two considerations always in mind. The first was to instruct students in both elementary and advanced astronomy, and the second was to take up at least one line of astronomical research that could be carried out successfully. In light of these considerations, the facility soon housed a combined transit and zenith telescope, a chronograph, chronometers, sextants for instruction, a powerful spectroscope with a range of dispersions (grating 14,438 lines per inch) and two prisms (light 13.1 mm, and dense 21.3 mm or battery 43.1 mm) used separately or in conjunction with the observatory's telescope.

Figure 13. McMillin Observatory above Mirror Lake. Postcard by S. F. Harriman, Columbus, printed in Germany

Figure 14. McMillin Observatory's 12.5-inch Warner & Swasey Refractor with Objective by Brashear (1897). Image credit: The Ohio State University Archives

Though the telescope was in place by December 1895,[61] the observatory's formal opening was deferred until Alumni Day, which was to be held on Tuesday, June 16, 1896.[62] A large audience attended formal opening ceremonies. *The Columbus Dispatch* described the gala event, "The exercise began at 2:00 p.m., and the music was furnished by the OSU Octet. Professor Henry C. Lord, director of the observatory, introduced the speakers. The main address of the day was delivered by Professor E. E. Barnard of the great Yerkes Observatory of the University of Chicago."[63]

"Hon. E. S. Wilson, editor of the Ironton Age, followed with a most interesting address, and a short speech by President Canfield closed the program. The observatory was then thrown open for the inspection of the visitors and the various instruments explained by Professor Lord."

McMillin was unable to attend the opening ceremonies. Still, his spirit of generosity permeated the air as his friend E. S. Wilson read a short communication prepared for the occasion. Wilson announced that McMillin offered to endow a fellowship in the

[60] Lord, H. C., The Spectroscope of the Emerson McMillin Observatory, *ApJ.* (4),50, 1896, pg 53
[61] Pollard, J. E., *History of OSU, 1873-1948,* p 119
[62] "Alumni Day at the O.S.U.," The Columbus Dispatch, June 16, 1896
[63] Ibid.

school of astronomy for five years at a rate of $300 per annum. It was to be awarded annually for merit in astronomical work.

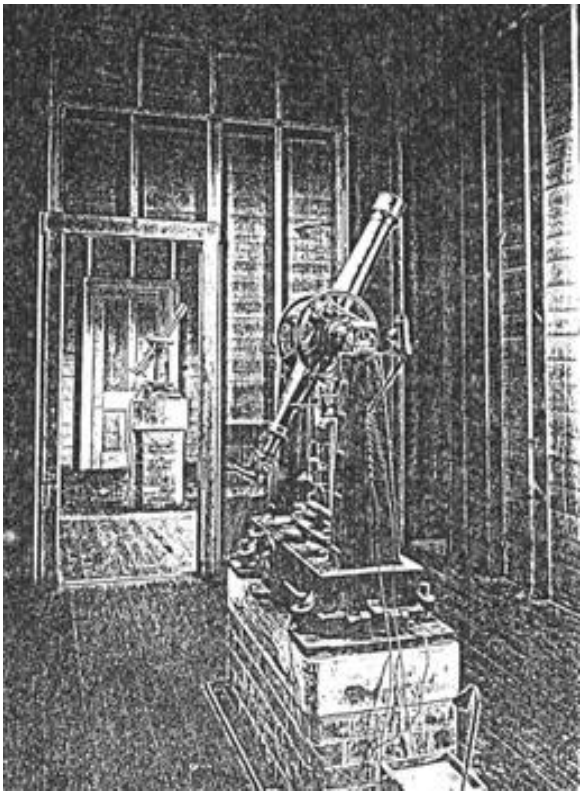

Figure 15. Two meridian transit telescopes west of the 12.5" telescope.

Once the observatory became fully operational, it was open to faculty and students. On the first and third Wednesdays of each month it was opened to the public that they might have a "peep" at the Milky Way" as McMillin had stipulated.

Figure 16. Henry C. Lord, first observatory director. He was referred to as the "Lord of the Heavens." His brother, Nathaniel Wright Lord (1854-1911), was a professor of Metallurgy and Minerology and was known as the "Lord of the Earth." Lord Hall on the OSU campus was named in their honor in 1911.

Figure 17. Emerson McMillin in his Library (1901). Image credit: The World's Work

From time to time, McMillin continued to support his namesake with generous contributions. In 1897, he provided a new corrector lens for the spectrograph, and in 1900 assisted financially with the construction of an astronomer's residence next to the observatory. Others also contributed to the development of the observatory and its work. Donations included a position micrometer, a chronograph, a Riefler sidereal clock, two chronometers, a Zeiss comparator, sextants, spectra maps, and books for a library valued at an excess of $1,500. Among the more important contributions were a helioscope by Gaertner, a stereopticon and stand, and a 10-inch Pratt and Whitney tool maker's lathe fully equipped. All were gifts from Mr. Julius F. Stone. A "wireless receiving set" was also given by Campbell Chittenden.

THE OBSERVATORY AND ITS WORK

The work of McMillin Observatory was that of teaching civil engineering students the basics of astronomy and the use of observatory instruments as well as performing work related to geodesy. To this end, two courses were immediately developed, *Practical Astronomy I* and *Practical Astronomy II.* The first course was required of third year civil engineering students and the second of fourth year students. The classes met four nights per week. Research in the field of astronomy was conducted as time permitted.

Once the main equipment was in place, Lord immediately set to work. In particular, he took advantage of the spectrograph provided with the refractor. He foresaw that this work was the line of work most suited to the location and the telescope. The spectrograph, prepared by Brashear, was designed to operate with either a single or combination of prisms or a diffraction grating. At its highest dispersion, the instrument could be used to determine star motion along the line of sight (radial velocity) with a precision of +/- 2 km/sec.

Lord's work with and modifications of the spectroscope gave him a certain preeminence in the field of spectroscopy.[64] He experimented with different ways to stabilize working conditions. He controlled temperature in the spectroscope and added an original compound correcting lens to the spectroscope in 1897.[65] So well was the work proceeding that within four years of the observatory's dedication, Emerson McMillin Observatory would be recognized in a German report as among "the top four astronomical observatories doing work on radial velocities."[66]

In June 1897, A. A. Common reported that Lord had been "balloted for and duly elected a Fellow of the Royal Astronomical Society."[67]

In August 1898, Lord published "Some Observations of Stellar Motions in the Line of Sight Made at the Emerson McMillin Observatory" thereby helping to establish his preeminence in the field of stellar spectroscopy.[68] The annual meeting of the American Association for the Advancement of Science was held in Columbus from August 21-26, 1899, at which Lord spoke about "Some Points of Spectroscope Design." In this talk, he compared the relative efficiencies of different spectroscopes.[69]

Of course, Lord was engaged in teaching *Practical Astronomy I* and *II* in addition to his research using the main telescope. He taught and performed his reduction work during the day and started nighttime classes as late as 11 p.m. The heavy workload and sleepless nights led to Lord to become involved in an October 1897 discussion of several astronomers at Yerkes Observatory protesting the working conditions. Lord was one of several prominent signatories on a resolution calling for improved working conditions for astronomers (Hale, 1898).

Lord married Edith L. Hudson (1878-1964) on June 22, 1898. Still, so much time was he spending at the observatory that in early 1900 the Board of Trustees was convinced that Lord, as observatory director, would be aided in his efforts if a house for him would be built immediately adjacent to the observatory. The erection funds were taken primarily from the accumulated proceeds of the sales of Virginia military lands when had been set apart for the building of residences for professors by an act of Congress dated April 17, 1882.[70] In addition, McMillin contributed money for constructing the two-story structure (which remained in place until 1925 when it was torn down to make way for a new residence for the University president).

Lord's reputation as a spectroscopist grew as the result of his research, presentations, and publications. As one consequence of this work, Lord was invited by the U.S. Naval Observatory staff to join them in their expedition to Barnesville, Georgia, to photographically record the solar flash spectrum[71] during the total solar eclipse of May 28, 1900. The observatory's spectrograph was adapted to fit the observatory's 4-inch Alvan Clark refractor, which was placed horizontally and fed by a 6-inch heliostat provided by the U.S. Naval Observatory. Eight exposures were obtained using a pneumatic bulb to advance the film's frames and by a line used to trigger a shutter near the objective of the telescope. Two hundred twenty-nine spectral lines were observed in the flash spectrum. The expedition and Lord's work were termed "highly successful."[72] In recognition of his productivity, Lord was promoted to full Professor in 1900.

With the turn of the new century, Lord continued to take stellar spectra. These spectra were obtained using 45- to 90-minute exposures and were made for stars nearly as dim as the fifth magnitude. On a typical evening, Lord would obtain two to four stellar spectra.

The work on stellar radial velocities was interrupted for about a year beginning in the spring of 1902. At that time, several additions were made to the back of the observatory, including a lecture room capable of holding 30 to 40 students, two additional observing rooms (one for a 2.5-inch zenith telescope in an attached building, and another in a separate structure to house three theodolites in which "up to 10 students can be worked at a time"), and a large basement which ultimately would become a complete workshop.

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[64] Lord, H. C., The Spectroscope of the Emerson McMillin Observatory, *ApJ* (4),50 (1896)

[65] Lord, H. C., The New Photographic Correcting Lens of the Emerson McMillin Observatory, *ApJ,* (6), 87 (1897)

[66] *Astronomisher Jahresbericht,* Vol 4, 1905 pp 384-385

[67] Common, A. A. (1897-06-11). "Professor Henry C. Lord, Director of the Emerson McMillin Observatory, Ohio State University, Columbus, Ohio, U.S.A.", *Monthly Notices of the Royal Astronomical Society*. 57(8): 565–566

[68] Lord, H. C. Some Observations on Stellar Motions in the Line of Sight Made at the Emerson McMillin Observatory, *Astrophysical Journal,* Volume VIII, No. 2, August 1898, pp 65-69

[69] *Astronomischer Jahresbericht,* Vol. 1, p 349 (11?)

[70] Pollard, J. E., *History of Ohio State University, 1870-1910,* p 302

[71] Lord, H. C., Observations of the Solar Eclipse of May 28, 1900, (13), 149 (1901)

[72] Lord, H. C., Eclipse of May 28, 1900, *ApJ* (12)64, 1900 (July) pp 64-67

Figure 18. McMillin Observatory viewed from southwest. Image credit: Grandview Height/Marble Cliff Historical Society.

Lord spent this time reducing observations and training a new observing assistant, Mr. Benjamin F. Maag. (Mr. Maag went on to earn his M.S. degree in 1899 writing his thesis on *A Method of Determining Time and Latitude by Means of a Surveyor's Theodolite*.) Lord's reduction work continued unabated until the summer of 1903 when, once again, he could return to his observations.[73]

Figure 19. Theodolite room with three theodolites (1912). Image credit: The Ohio State University Archives

One of the stars observed in the fall of 1901, Eta Piscium, had shown a radial velocity of 21.9 km/sec in recession. By 1904, that speed had dropped to 12.3 km/sec. After checking and rechecking his calculations to ensure that the rates reduced to those relative to the sun were correct, Lord announced that he had discovered one of the first of many stars to be referred to later as a "spectroscopic binary star system."[74] According to Lord, the stars were of magnitude 3.5 and 11 and had a period of 58 years. The work was later confirmed by W. W. Campbell and Heber D. Curtis, who subsequently discovered nine such stars quickly.

Figure 20. McMillin Observatory. Image credit: Grandview Height/ Marble Cliff Historical Society.

Figure 21. McMillin Refractor (1905). Image credit: The Ohio State University Archives

[73] Lord, H. C., On a Possible Variable Radial Velocity of Long Period, *ApJ* 19, 246 (1904)

[74] ibid.

By 1905, Lord's work would be interrupted again, but this time by something that would continue to plague his efforts and all work of the observatory for years to come – light and air pollution.[75] When the observatory was constructed ten years previously, it was situated some distance from Columbus. Now, it was found within the city limits (population 150,000) and not far from the main campus buildings.[76] The campus was encroaching upon the observatory, and the pollution due to the burning of soft coal by the residents of Columbus was making observation increasingly difficult. Lord noted the harmful effects of light and air pollution on his work. In early 1905, he complained of this problem in print. Referring to the deteriorating conditions, Lord concluded that it seemed "advisable to draw the work to a close and turn to some other line of investigation better suited" to the then prevailing conditions. Besides, larger instruments were becoming available around the world, and they were better suited to this work.

About this time, Lord was kept busy with public observing sessions as a result of wide interest in Mars. Percival Lowell's claims of life on the Red Planet captivated the general public. Observing sessions were held periodically throughout the summer opposition of 1907. Lowell's observations that summer were inconclusive, as were those of 1909. The general public began to lose interest in Mars as a possible abode for intelligent life. Other observers besides Lowell were watching Mars with larger telescopes, and by 1909 had resolved Lowell's canals into a series of marks and spots. After these results were made public, the public's love affair with Mars began to subside.

Figure 22. Professors Lord and Coddington preparing for the 1910 Halley's Comet Solar Transit Expedition to Hawaii. Image credit: The Ohio State University Archives

The sky of 1910 provided a genuine spectacle – Halley's Comet. Lord was called on to interpret astronomy to the general public once again. He did have an opportunity, however, to observe the comet from a unique vantage point. An expedition to Hawaii in May of 1910, for the express purpose of discovering the effect, if any, of the transit of Halley's Comet across the disk of the sun upon the lines of the solar spectrum, was prompted by McMillin. McMillin paid the entire costs of the expedition, which amounted to $1,500. The mission was unsuccessful, however, because of heavy cloud cover.

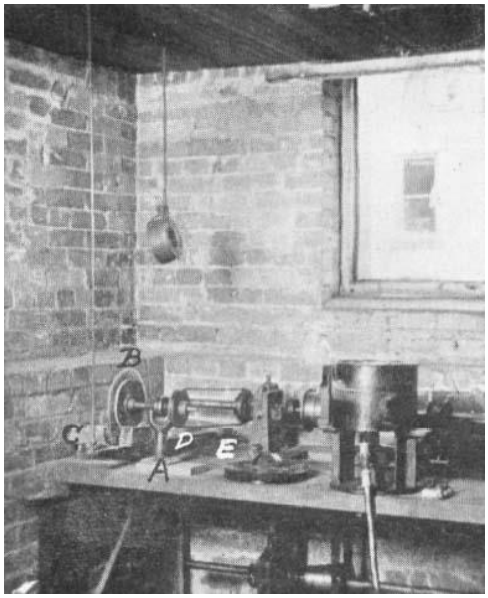

Figure 23. Workshop in the basement of the observatory.

By 1915, Lord's interests had turned to astronomical optics[77] and astrophotography.[78] The basement of the observatory that contained a machine shop was used as an optical shop by Lord. Using imported optical glass and machine tools such as drill press and turning lathe, Lord was able to cut and polish small lenses. Before 1915, Lord developed and began teaching a course called *Applied Optics* at the observatory. In a 1915 publication, he described how he made lenses and assembled them into cameras following roll film development.

Lord's duties were split in 1917 when he accepted a position as instructor in the U.S. Army School of Military Aeronautics on campus in May of that year. He continued working in astronomical photography,[79] stellar motions,[80] and double stars in the ensuing years.[81] Lord retired in 1923 as the directorship of the Emerson McMillin Observatory. Professor Lord would die two years later.

[75] Lord, H. C., Observations of the Radial Velocities of Thirty-One Stars made at the Emerson McMillin Observatory, *AJ,* Vol XXI, No. 4, (May 1905), p 297

[76] Lord, H. C., On a Possible Variable Radial Velocity of Long Period, *ApJ* 19, 246 (1904)

[77] *ApJ* 38, 297-300

[78] *MNRAS* 76, 197-204

[79] Lord, H. C., Illumination of Field of Photography, *MNRAS* 76, 197

[80] Lord, H. C., Stellar Tables till 2000 AD, *Popular Astronomy* 27,572 (1919)

[81] Lord, H. C., Double Stars, *Astronomical Journal,* 32, 191

Figure 24. Darlington at Mahwah, NJ.

Figure 25. McMillin Observatory seen from the west (1919). Image credit: Grandview Height/Marble Cliff Historical Society.

Shortly before Lord's retirement McMillin Observatory also would lose its most generous supporter and benefactor. Emerson McMillin would die on Wednesday, May 31, 1922, at his country home, "Darlington,"[82] near Mahwah, New Jersey. McMillin expired after two days of extensive illness following two years of general ill-health. The official cause of death was pneumonia.[83]

Figure 26. [Osirus] Emerson McMillin (1844-1922)

EMERSON McMILLIN

At the time of his death, McMillin was known as a great patron of the arts and was greatly interested in world problems. He gave constantly and generously to those less fortunate and frequently donated to civil and educational projects.[84] He was a member of numerous organizations whose goals were the improvement of the public good. Upon his death, he was president of the Arbitration Society of America.[85] During the Spanish American war he purchased a farm in West Chester County, New York, and established there a home for the wives and children of soldiers, that he later turned into a vacation home for factory girls and maintained for many years at his own expense.[86] He was a member of the "Committee of 100" whose goal was the establishment of an International Court of Justice.[87] He was also one of the principle organizers of the World Court League. During World War I, even before the U.S. became involved, McMillin made large contributions to the financial support of Italy, in recognition of which he received from King Victor Emmanuel in 1918 the order of Chevalier of the Crown of Italy.[88]

McMillin didn't let his financial success and obligations interfere with his acquisition of knowledge, a lifelong pursuit. For 50 years he devoted five hours daily to study, the first 25 to the sciences and the second 25 to the humanities.[89] He was self-taught in French (with the assistance of native speakers)[90] and an art collector of unusual discernment. Paintings he sold in 1914 netted $442,395.[91] At this auction, the sale of "Orpheus and Eurydice" alone brought in $75,200.[92] His collection was quite personal and described at the time as "the finest collection of American and foreign pictures ever sold in this country."

[82] *Who was Who,* 821
[83] "Emerson McMillin Dies of Pneumonia," *New York Times,* June 2, 1922, pg. 17, col. 3
[84] Cyclo, 170
[85] Ibid.
[86] Ibid.
[87] Ibid.
[88] Ibid.
[89] Ibid.
[90] WW, 1202
[91] "Emerson McMillin Dies of Pneumonia," *New York Times,* June 2, 1922, pg. 17, col. 3
[92] Ibid.

Figure 27. Aerial View of Observatory (1922.) Image credit: Grandview Height/Marble Cliff Historical Society.

Figure 28. Edmund S. Manson, Jr., second observatory director.

Sometime before 1908, Edmund S. Manson, Jr. came to assist Professor Lord. He was interested primarily in the elements of positional astronomy. Manson published numerous articles dealing with Halley's Comet observations,[93] the location of asteroids,[94, 95, 96] occultations,[97, 98, 99] double stars,[100] solar motion,[101, 102] and globular clusters.[103] Manson made critical observations of some 90 asteroids. With Lord's retirement in 1923, Manson became director of the McMillin Observatory.

During 1925-26 Donald H. Menzel (1901-1976) was a staff member.[104]

Due to its small telescope size and deteriorating sky conditions, research and instruction at McMillin Observatory began to diminish considerably. By 1931, with the completion of Ohio Wesleyan University's Perkins Observatory just a few miles to the north, the McMillin Observatory was no longer in demand as a research facility. That year, the staff of the observatory was reduced to Professor Manson and a single student assistant.[105]

Figure 29. H. C. Lord passed away at 59 years of age (1866-1925). Image credit: The Columbus Dispatch.

Since the study of astrophysics had brought astronomy so close to the study of physics, Dean Shepard of the College of Arts and Sciences recommended that the astronomy program be transferred to the Department of Physics. The Board approved this recommendation of Trustees, and the astronomy program remained a part of the Physics Department from 1931 until 1961.

[93] Manson, E. S., Observations of Halley's Comet, *AN* 191, 129

[94] Manson, E. S., Asteroid Positions at McMillin Observatory *AN* 182, 387 (1908)

[95] Manson, E. S., Asteroids, *AN* 196, 333

[96] Manson, E. S., Five Asteroids", *AN* 199, 269

[97] Manson, E. S., Occultations of Stars, *AN* 193, 87

[98] Manson, E. S., Occultations, *AJ* 38, 72

[99] Manson, E. S., Lunar Occultations, *AJ* 41, 176 (and 32?)

[100] Manson, E. S., Double Stars, *AJ* 38,202

[101] Manson, E. S., Solar Motion, *AJ* 30, 149, 81

[102] Manson, E. S., Solar Motion, *Popular Astronomy* 29, 633 /1921)

[103] Manson, E. S., Globular Clusters, *Publications of the AAS* 7,32

[104] Smith, A. W., *Nine Decades of Physics and Astronomy*, 1963, pg.114 (OSU Centennial Histories)

[105] Ibid.

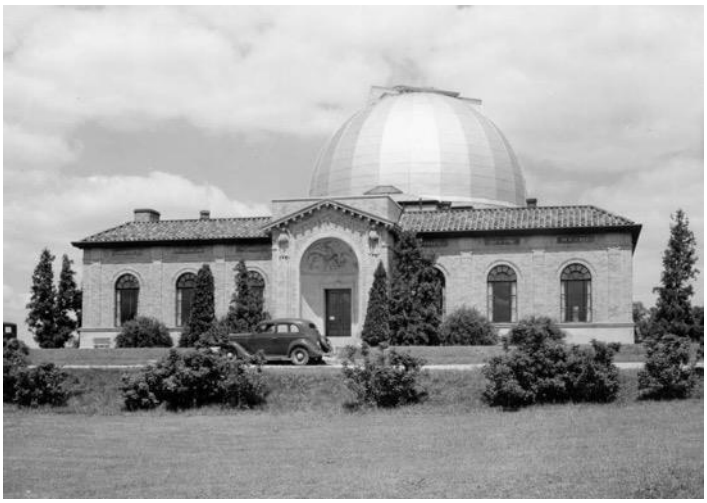

Figure 30. Perkins Observatory, ca. 1940. Image credit: Ohio Memory

In the early years of the Great Depression, Ohio Wesleyan officials realized that the University could not properly staff and finance a research and teaching program at Perkins Observatory, which then housed the third-largest telescope in the world.[106] Demands for newer and better equipment and the fact that the observatory was not located on the Ohio Wesleyan campus made its maintenance cost-prohibitive. The 69-inch reflecting telescope located there would not contribute to high-grade research unless an able staff was maintained. For these and related reasons, most of OSU's astronomical research would be conducted at Perkins Observatory with its larger equipment and better observing conditions. The McMillin Observatory had outlived its usefulness.

In 1935, J. Allen Hynek joined the McMillin Observatory staff. Working with N. T. Babrovnikhoff, Hynek observed Nova Herculis in 1934 and Nova Lacerta in 1936.[107] In 1946, the directorship of Emerson McMillin Observatory fell to Hynek upon the retirement of Professor Manson. At the same time, he carried a double role, for he was also director of the Perkins Observatory. Because of the constraints on the McMillin Observatory's use, by 1946-47, the telescope would be characterized as being used for "student instruction only."[108] Still, the observatory was used for astronomical research.

In 1951, Hynek assembled a photoelectric photometer for the McMillin refractor.[109] In the following year, he began an investigation of the scintillation of stars in the daytime as part of an "Astronomical Seeing Project" funded by the United States Air Force.[110]

Figure 31. J. Allen Hynek (1910-1986), taken 1954. Image credit: The Ohio State University Libraries.

Figure 32. McMillin Observatory (1946). Image credit: The Ohio State University Archives

[106] Smith, A. W., *Nine Decades of Physics and Astronomy,* 1963, pg. 114 (OSU Centennial Histories)
[107] *Publication AAS* 8, 209
[108] Observatory Reports, *Astronomical Journal,* 53,148 (1946-47)
[109] Observatory Reports, *Astronomical Journal, 56,* 163 (1951)
[110] Observatory Reports, *Astronomical Journal, 57,* 185 (1952)

Some of the last astronomical research to take place at McMillin observatory would have to do with the determination of shadow-band structures from stellar scintillation measurements by William M. Protheroe in 1954.[111]

On September 6 and 7, 1956, an open house at McMillin Observatory hosted by the Columbus Astronomical Society drew some 1,500 people over two nights to view Mars at its opposition.[112] Subsequent observing nights also drew large crowds who turned up to peer through the telescope and attend presentations in the observatory's planetarium. The 15-foot diameter planetarium was added in 1956 (?) with seating for 24. The dome housed a Spitz A-2 planetarium projector.

In 1959, Hynek relinquished his post to take a teaching position at Northwestern University. Dr. Arne Slettebak undertook the job. In 1960, with the US military aid, a luminous shock tube lab was set up in the basement of McMillin Observatory and used by Mr. Paul Byard. This would be one of the last improvements that McMillin Observatory would see. In 1961, Slettebak became the chairman of the newly independent OSU Astronomy Department. After 30 years of connection with the Physics Department, the Astronomy Department was once again a separate entity.

Over time, the staff and graduate program continued to grow, but McMillin Observatory didn't. McMillin had long since grown too small for the total astronomy program. McMillin Observatory was used for instruction until 1962. The dome jammed during that year and was declared unsafe to open.[113] With the dome permanently closed, the telescope was now completely useless. At about this time, a woman almost fell through the floor of the observatory.[114] The observatory's days were numbered.

In 1964, the University Trustees decided to relocate the Astronomy Department to a new location atop Smith Laboratory of Physics. By 1968, the move was completed, and the now dilapidated McMillin Observatory was officially closed. Vandalism and breaking and entry prompted a 1974 proposal to the University's Board of Trustees to demolish the structure. The motion was not acted upon.

With the demolition of the McMillin Observatory imminent, the university sought to find someone who would take the observatory's now too small telescope. A willing recipient was soon found. In 1975, the Astronomy Department decided to donate the telescope to the Kaubisch Memorial Library of Fostoria, Ohio, that would work with the Fostoria Astronomical Society to make it part of the library's public education program. It was also expected to be available to students from Heidelberg College, Findley College, and Bowling Green State University. According to Dr. William Protheroe, professor of astronomy, the department was unable to move the telescope to Smith Lab because of the size and weight of the instrument. According to Protheroe, "The library will use the telescope in an active way for public instruction closely related to the terms of Mr. McMillin's gift to the university."[115]

Four individuals from the Fostoria Astronomical Society began preparations to remove the telescope from the observatory dome with the aid of a local construction firm. After some three weeks, the removal work was completed. The telescope was moved to the Union Carbide plant in Fostoria on July 4, 1975, where it was put through seven months of refurbishment to make it operable. [116]

Figure 33. The Doomed Dome (1976). Image credit: Brent A. Archinal

The now-empty McMillin Observatory rested placidly over the next two years. Piece by piece, the equipment was all taken away until nothing remained but the hollow shell of what had once been. The observatory building itself, sadly marred by weathering, would soon disappear. At their meeting on May 7, 1976, the OSU Board of Trustees resolved to demolish the building. Demolition was to be completed on July 1, 1976. On June 15, 1976 – on the last day of its 80th year – the time-worn structure was reduced to rubble.

[111] Protheroe, W. M., Determination of Shadow-Band Structure from the Stellar Scintillation Measurements, *AJ* 59, 331(A) (1954)

[112] Letter from Steadman Thomas, Acting President of CAS, dated Sep 12, 1956

[113] McMillin Gave OSU Observatory, Lake, David Shreiner, The *OSU Lantern*, 10 November 1967.

[114] McMillin Observatory views long past, Chuck Reinhart, *The OSU Lantern,* 2 March 1976

[115] *On Campus,* Volume 5, No. 2, September 22, 1975

[116] *The Emerson McMillin Telescope: A Unique Learning Experience,* Kaubisch Memorial Library, Fostoria Astronomical Society, City of Fostoria, July 1977.

THE FINAL CHAPTER

After seven months of cleaning and refurbishing, the Emerson McMillin telescope was reassembled and displayed. In March of 1977, some 800 people viewed Saturn at a home show in Fostoria. Plans had been made to house the telescope in a structure built on land donated by Norman and Eunice Fruth.[117] A $140,000 structure was planned to house the refurbished instrument.[118]

Despite efforts and encouragement by three universities, Ohio Senator John Glenn, thirty-seven high school science teachers, the most extensive public endorsement ever at a revenue-sharing request meeting, and three city council members, the Kaubisch Memorial Library, and the mayor of the city, there was still a question about the propriety of locating a city-owned structure outside the city limits. So, after nine years of rest in Fostoria, the telescope remained unused for lack of a good home.

The project was finally saved by Doyle Ballreich, a resident of Tiffin, Ohio, and president of the Ballreich Potato Chip Company. Charles Clark, a Union Carbide engineer, had spoken with Ballreich about the possibility of housing the McMillin telescope at Camp Hertzer near Tiffin, not far from Fostoria. Ballreich was intrigued by the opportunity and prepared a plan. Ballreich would have the observatory built on land obtained from the Tiffin Rangers, where he was a board member. He would ask Tiffin businesses to help with material and labor for construction, ask Heidelberg College to secure permission from Kaubisch Memorial Library to transfer ownership to Heidelberg College, get the Fostoria amateur astronomers to operate the observatory along with Heidelberg physics and astronomy staff, and have it all come together in a timely fashion. The McMillin telescope left Fostoria in March 1984, and by September 28, 1984, the observatory in Tiffin had its new occupant.

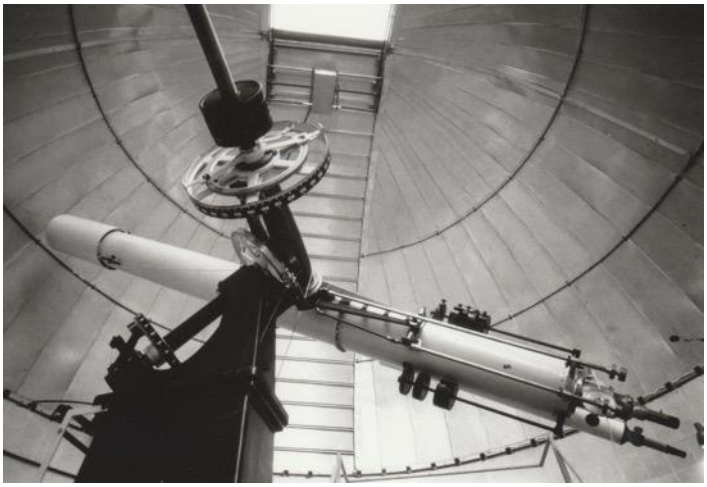

Figure 34. McMillin Refractor (February 1986). Image credit: Robert Bunge.

Figure 35. McMillin refractor today. Image credit: Observatories of Ohio

Today the 12.5-inch Emerson McMillin refracting telescope is officially housed in "The Ballreich Observatory – Camp Hertzer." The telescope is owned by Heidelberg College of Tiffin and is operated mainly by the Sandusky Valley Amateur Astronomy Club, an outgrowth of the Fostoria Astronomical Society. The observatory is located some seven miles north of Tiffin and is used both day and night by physics and astronomy students and scout, church, and school groups hosted by SVAAC members.

[117] The information about the final disposition of the McMillin telescope in the following paragraphs was provided by Roger V. Wise, a member of the Sandusky Valley Amateur Astronomy Club.

[118] Personal letter from Dennis Saldusky dated September 4, 1976.

Figure 36. Name plate on telescope at Ballreich Observatory

Figure 37. Ballreich Observatory in 1996. Image credit: Author

Emerson McMillin's lifelong interest in astronomy led him to erect and equip an astronomical observatory in Columbus.[119] The Emerson McMillin Observatory served the community well for many years. Twice-monthly observing sessions provided many with their first and perhaps only chance for a "peep at the Milky Way," as McMillin had stipulated. The reminders to the University are gone, but McMillin's generosity lives on what is most important.

Over the years, astronomers working at the Emerson McMillin Observatory made significant contributions to the science of astronomy. Still, one of the most important contributions was in response to McMillin's request that the general public might have an occasional "peep at the Milky Way." During its years of existence, thousands enjoyed and continue to enjoy through the generosity of its founder, their first glimpse of the heavens' real glory. *Sic transit gloria mundi – et caeli.*

Endnote: On the 100th anniversary of the McMillin Observatory's founding, a festive celebration was held at the Ballreich Observatory, at Perkins Observatory, and on the campus of Ohio State University by members of the OSU graduating classes from the 1970s. An earlier version of this document was read at the Perkins Observatory gathering by its author.

Figure 38. 100th Anniversary Reunion at Ballreich Observatory. Top row (left to right): Mitch Luman, Brent Archinal, John Kerns; middle row: Brent Warner, Carl Wenning, Jay Elkes, Rob de Santos; bottom row: Wilkie Cirker. Image Credit: Author.

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[119] Cyclo, 171.

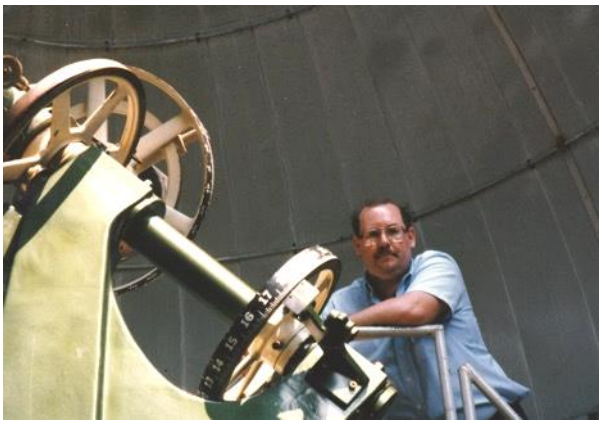

Figure 39. Carl J. Wenning with the McMillin Refractor, June 1996. Image credit: Author.

Appendix 1

EMERSON McMILLIN

Remarkable Career of an Ironton Man

Ironton Register - April 8, 1897

Written by Lida Rose M'Cabe

Taken from *The Emerson McMillin Story* by Elaine Winkler

"If you have the footprints and the handprints, you can tell the whole man." A growing power in the conservative financial circles of New York and a brilliant light in the Ohio colony is Mr. Emerson McMillin.

To the superficial observer his masterful rise, in less than five years, in the vortex of Wall Street, may seem, even for this country, accustomed to the pyrotechnics and of self-made men, phenomenal. A glimpse at the years that preface it, however, will convince the sober-minded that it is the legitimate, the logical sequence of tireless energy, indefatigable industry and high purpose allied to great natural ability. Unlike the proverbial prophet, Mr. McMillin is happily not without honor in his native state. Much of his achievement familiar to readers of scientific and technical journals, however, is to the general public "another story."

That the international repute that is now his is but the crystallization of the forces he brought with him to the metropolis, a resume of the "steps by which he did ascend," not only substantiate, but lend new life to a truism of the sage of Concord, "a man takes no more out of a country than he brings into it."

Birth and Early Training

Emerson McMillin was born in the village of Ewington, Gallia County, Ohio, in 1844. He is of Virginian ancestry. One of a large family, he was nurtured in poverty and toil. Twelve years of age found him in charge of the engine of a blast furnace, where for four years he did all sorts of menial labor incidental to the making of iron.

In this rugged outdoor life, Nature's priceless gift - a splendid physique - was early developed laying the foundation for the Herculean tasks of subsequent years. In physical strength, he outstripped as a lad the strongest men employed at the charcoal kilns. His scanty earnings went to the support of the family. He never went to school until he was 15 years old, and then only for three months. Two years later came the Civil War - that great University Extension, in which quickened to early maturity the youth of the past generation. Twice rejected on account of his age, the Sandow of the charcoal country finally succeeded at the age of 17 in following his father and five brothers into the army, where their bravery won the sobriquet, "The Fighting McMillins." At the end of four years, Emerson was a commissioned officer, having participated in a number of hard fought battles and received five wounds. "He has a splendid war record," said a distinguished and discriminating officer, in recounting to the writer his impression of the man.

In camp, his natural mental bent manipulated itself, as did his moral courage and physical endurance in the field. While his comrades whiled the leisure of winter quarters in drinking and card playing, young McMillin devoured the few books he had gathered, works pertaining largely to chemistry and the natural sciences. While encamped in the mountains of Virginia his attention was turned to geology. His explorations there laid the nucleus of the knowledge that later was of signal service to himself and to Ohio. As a commissioned officer he had saved a little money, and when the war closed, he shifted about for a business opening.

First Business Venture

Three times with varying fortune he embarked as a country merchant in Gallia and Lawrence Counties. In a desultory way he kept in touch with the reading that had attracted him so strongly as a lad. Discontented with the limitations of a country store, he at length branched out with his brother in the purchase and sale of coal, etc. This brought him again in contact with blast furnaces, sawmills, and similar industries. Finally, he drifted to Ironton, which, as the name implies, is an iron town. The Ironton Gas Works were then in process of erection. While seeking employment the ex-merchant attracted the attention of the superintendent of gas construction, and soon with pick and shovel he was in the army of them employed. There was no part in the mechanical construction of the works to which Mr. McMillin did not lend a helping hand. His adaptability and his skill developed rapidly and when the works were completed, he was offered similar labor in the south at much larger wages. He was about to accept, when the superintendent of the Ironton Works, who had observed his studious habits and his mental caliber, advised him to remain at Ironton. "There is no one in this locality who understands the chemistry of gas - the whole gas industry is in an experimental stage," he assured the ambitious day laborer. "You have a field and an opportunity here that may never come again." The advice was accepted.

It was the turning point in the career of the man today universally acknowledged one of the foremost authorities in the gas world.

Coming into His Own

As superintendent of the Ironton Gas Light Company, Mr. McMillin became identified in 1867 with the gas fraternity. The superintendent of a small gas works in those days was not the technically trained man of the present. Nowhere, perhaps, is his

inherent force of character more decisively revealed than in the precedent Mr. McMillin established in that county plant.

Personally familiar with every detail in the construction of the works, he now turned with characteristic energy and thoroughness to a study of the science involved in the generation of gas. To this end a laboratory was fitted up in the Ironton Gas Works. For several years his days and nights were largely devoted to the study of chemistry and kindred subjects. Men of similar tastes were welcome, and for the first time in his life the layer of gas pipes found congenial work in the probing of nature's secrets. In his tireless mental activity, he soon added to his scientific investigations, metallurgy, which was pursued with indefatigable industry until 1883.

First Fruits

Living in a region whose rich natural iron resources were just beginning to be developed, his attainments as a metallurgist were soon recognized. In rapid succession he became general manager of the Lawrence Iron Works, vice president and general manager of the Crescent Iron Company, president of the Iron and Steel Company and general manager of the New York and Ohio Steel Company, which operated rolling mills, blast furnaces and coal and iron mines.

The success of these companies during a period which witnessed the greatest depression in the iron and steel industry of the United States was general conceded to the scientific and technical knowledge of the self-taught man at the helm. Here is the cornerstone of Mr. McMillin's career as a financier.

While managing these great iron interests he upset the original geological survey of the state. Having occasion to build a line of railroads to reach one of the mineral properties belonging to his company he perceived in the geological formation of the section marked variations, unlike what his study of the state survey had led him to look for. Further investigations convinced him of the inaccuracy of the accepted survey. He brought the matter before the state authorities. A resurvey was made. Mr. McMillin was a member of the geological corps which carried out the undertaking. Had his material interests been then less securely established, he would in all probability have become more thoroughly identified with this branch of science and served the state in an official capacity. Later he became president of the Ohio Institute of Mining Engineers.

Midst these varied absorbing interests awoke the instinct of the scholar, the specialist. Frequent contributions from his pen found their way into technical journals. Gas associations were frequently regaled by addresses which revealed Mr. McMillin an original thinker and close student of economic problems. Since those tentative days, the man who never had but three months' schooling has addressed in the most acceptable manner various scientific associations made up for the most part of college bred men. As befits the clear thinker his style is simple and direct.

A Larger Field

Finding himself in 1883 owner of several small gas plants in various localities, Mr. McMillin, desiring a central point for further operations, left Ironton and settled in Columbus. It was not long until a little bird whispered in the ears of the stockholders of the Columbus Gas Works that there was a grown "child among them taking notes." "If you don't look out," piped the augury, "that man McMillin will gobble you up." Soon he tendered the management of the Columbus Gas Company.

Columbus gas is made from coal. At this period water gas and electricity were making such rapid strides that many experts prophesied the Waterloo of coal gas companies.

The midnight vigils of the laboratory at Ironton now spoke out in meeting. Mr. McMillin maintained that these competitors - water gas and electricity - could be made valuable aids to increase coal gas competition and swell profits. This truism today universally accepted was then regarded by conservatives [as] rank heresy. As manager of the Columbus Gas Company, Mr. McMillin was the first to promulgate this idea - that the cheaper the price of gas the greater the profit.

He thus practically revolutionized the gas industry of the country and became known as the "cheap gas man." His voice and pen have always been and continue to be in the vanguard of progress.

An Economic Problem

To his broad and comprehensive study of social economics, no less than to his generous heart and keen sense of justice are due the profit sharing system now in operation at the Columbus Gas Works. Economic students throughout the country, and educational institutions, notable the Chicago University, are watching with lively interest the outcome. Twelve years ago, the company began in an indirect way to share profits with the employees. In 1895, the present indirect method was adopted. When Mr. McMillin assumed charge of the works intemperance was a serious obstacle to good service. The man who never tasted spirituous liquor until he was past 30 threw a bombshell into this bacchanal community in the shape of a placard stating that the employee who indulged in liquor during working hours would forfeit his position. The entrance gate to the works was put under strict surveillance. No man was allowed to pass out during working hours without a special permit. Old employees were disposed to treat the edict as a huge joke. But they were not slow to discover that beneath the genial, sympathetic personnel of the new manager was a will of iron. Some of the oldest, most valued men were sacrificed to the common good.

This drastic measure eventually revolutionized the works and assured faithful, devoted services. A second difficulty was to keep the men at work. The intense heat, especially in summer, not only incited great thirst, but invited truancy. Often half the force would disappear for several hours or a whole day. It was

necessary to employ an official at an annual salary of $1,200 to hunt up the men, keep them at work or find a substitute. To obviate this, Mr. McMillin conceived the idea of offering a premium or bonus to each man in proportion to the amount of service rendered. The working year is divided into four quarters of 90 days each. To the man who worked a full quarter was given a premium of $10. If he put in four full quarters, he was allowed at the end of the year an additional $25, making a total premium of $65 for 360 days' work. The effect was instantaneous. When compelled to lay off each man found his own substitute. The $1,200 official was dispensed with.

Temperance established, the company decided to divide equally the saving in cost of labor per unit of product. For instance, if the cost of labor pr unit of product was reduced 5 per cent, in any one year, as compared with the preceding year, the men's wages would be increased 2 1/2 per cent from that time on. Eventually the company reached a point where further reduction was not possible, and the system became practically inoperative. In 1895, the present system was introduced. It will continue indefinitely and in all probability be established in the various gas companies throughout the country under the control of the originator. The Columbus Gas Company now pays its men a dividend at the same time and at the same rate paid to stockholders. At present it pays 6 per cent per annum to stockholders, payable semi-annually. The stockholder's dividend is figured on the amount of his stock. The employee's dividend is figured on his earnings. If an employee earns $1,000 a year, he receives a dividend of $50. No distinction is made. Every employee from the president down is entitled under certain restrictions to participate in the dividend. About 75, or nine-tenths of the regular employees of the Columbus Gas Works participate. The conditions are:

- 1. The employee must have been in the service of the company for one year preceding the beginning of the six months for which a dividend is declared.
- 2. His services must have been continuous and satisfactory. If compelled to be absent, a satisfactory substitute is accepted.
- 3. Until an employee has become the actual owner of at least three shares of stock, either through dividends of by purchase, the company may pay the dividend in stock. Being a bona fide holder of three shares of stock, an employee is entitled to cash dividends.

It is the desire of the company that all their employees should become stockholders. In this they will probably fail. More than half the employees sold their first stock dividend. Several have been paid.

The effect of the system is most satisfactory, since it reduces the cost of the manufactured product, increases the remuneration of the men, while strikes are unknown. Five years ago, the company provided its employees with a large hall, lighted and heated. Billiards and pool tables, a card room and reading room, with scientific books, magazines and papers, lend new interest to the bond that has grown up between employer and employee. During Mr. McMillin's 13 years' management the harmony of the Columbus Gas Works has never been marred.

The Master Stroke

His skill as an organizer was not fully demonstrated to capitalists until 1889, when, by a masterly stroke, he succeeded in amalgamating four warring gas organizations of St. Louis into the Laclede Gas Light Company. Not uninteresting is the story of this deal, largely instrumental in establishing his present status in New York. Mr. McMillin and the late George Shepherd Page of New York were the American agents of the American Industrial Syndicate, Limited, of London. Sir Julian Goldsmith, president of more than 100 gas companies and one of the richest men in England, and the late Duke of Sutherland, with five other English capitalists, were directors of this organization. The syndicate was seeking investments in American gas properties. At first effort was made to secure only one of the companies, and that by lease. The English capitalists were not kindly disposed toward the enterprise and New York and St. Louis capital was enlisted chiefly through the banking house of H. B. Hollins & Company, New York. The scope of the enterprise grew until it finally resulted in the purchase of all the companies in St. Louis. The value of this property, estimating by the price at which its securities were selling on the Stock Exchange, is about $13,500,000, or two and a quarter times the market value of the securities of the companies before the purchase. Mr. McMillin was elected president [on] June 1, 1889. He accepted such against his will, and on the condition that he would not be required to serve beyond the following January. He is still president.

The success of this enterprise won for him the confidence of the most conservative and influential financiers. They recognized in him not only accurate perception of the values attached to fixed conditions, but clear, farseeing judgment of men - in short, the qualities of a leader.

To Pastures New

When it became known in 1891 that there was a doorplate in Wall Street bearing the name Emerson McMillin & Company, Bankers, wiseacres declared that the successful manager of gas companies should stick to the gas business and fight clear of the goldbugs' kingdom. Now they realize that the "cheap gas man" knew what he was about and built better than he knew. The firm deals chiefly with gas and railway companies - their financiering. It is an independent organization for financing of large investments. It is not subject to the banking laws. When Mr. McMillin left Columbus, June 1891, with his banking project on paper, he thought if he could get a capitalization of $1,000,000 it would be a big thing. To date the banking house of Emerson McMillin & Company has financed properties representing capitalization upwards of $40,000,000.

The highest testimony to the natural, conservative and intelligent methods by which the business is conducted is the fact that in no

instance has the corporations represented by this great sum of money failed to realize in every particular the expectations and representations of the firm and its patrons.

Scarcely a large investment now seeks Wall Street without coming directly or indirectly to the McMillin Banking House. The most profitable deal it has made was that of the Welsbach Commercial Company, by which was cleared more than $300,000. In bringing this about Mr. McMillin worked 19 hours a day for more than two months.

International Repute

The success of the banking house was augmented greatly by the international renown its founder achieved through the successful launching of the East River Gas Company of Long Island City, which supplies gas to New York City through a tunnel under the East River. Mr. McMillin not only originated the idea but enlisted, through the confidence he had won from the most conservative financiers, the co-operation that made this gigantic enterprise practical. As an engineering feat, the tunnel, even up to the day of its formal opening, was declared by many able engineers an impossibility. Though the troublous, seemingly insurmountable obstacles arose, enough to intimidate the bravest stockholder, his extraordinary force guided the scheme to successful completion.

Despite, Mr. McMillin disclaims credit beyond originating the plan and influencing capitalists to invest, specialists employed in its erection generously assert that the influence of his judgment, his experience, predominates everywhere throughout this marvelous enterprise, with which his name will always be indissolubly connected.

The Business Family

No banking house in the country, perhaps occupies more substantially luxuriant quarters. They were designed especially for this firm and have been frequently complimented by imitation. Eleven rooms comprise the suite. Finished in oak, with polished floors, marble tile corridors, Turkish rugs - they replete in the paraphernalia that goes to make up the business shrine of the modern millionaire. The spacious tiled entrance is flanked on the left by a finely equipped counting room, while to the right is the office, rather the library, of Mr. McMillin's private electrician or specialist. Adjoining is the sanctum of the firm's specialist, beyond which is the imposing council chamber, stolidly furnished, as befits the capitalists of Midas' touch who congregate there to concoct enterprises involving sums sufficient to take away the breath even of a scribbler disciplined to chronicle the goodies of the elect. Across the hall and confronting these apartments and the main entrance are the public and private offices of Mr. McMillin, his partner, Colonel Henry B. Wilson, his son, Emerson McMillin, Jr., bookkeeper, Mr. W. F. Douthirt, solicitor and two room reserved to Miss Jenkins, the private secretary and trusted confidant of the firm. It is distinctly an Ohio settlement.

Any delinquencies in the master's knowledge of the banker's art is more than compensated by the courteous and accomplished Colonel Wilson, whose business training was secured in the banks of his native town, Ironton, where he was associated in Mr. McMillin's early projects. Likewise, an Ohioan is Mr. Douthirt, a son of Delaware, whose social, no less than his legal career at Ohio's capital culminated so auspiciously in his marriage to the clever Miss Gray, only daughter of the railroad magnate D. S. Gray.

A Buckeye by adoption is Miss Jenkins, to whose skill and faithful service, covering more than a dozen years, her employers owe no small share of their solidity.

Six thousand dollars per year is considered modest rent for these spacious Wall Street quarters, to which come, sooner or later, itinerate Buckeyes on business or pleasure bent, always sure - it matters not what great scheme may be brewing - of cordial welcome and Godspeed.

The Secret of Success

"Great physical strength due in a measure to my boyhood training," says Mr. McMillin, "has made enormous work and constant study possible. I require less sleep than most people. Four hours suffice. To my daily habits I attribute largely the success that is credited to me. I always know what I am going to do. I may be obliged to alter my plans, nevertheless no time is wasted in considering what to do next. I generally decide quickly and rarely change. In talking up a business scheme I always consider first what not to do. I have learned this valuable lesson from the hundreds of people who have submitted projects to me. Invariably they consider but one side - what to do. Now if they had looked at it as thoroughly from the other point of view, they would often have saved themselves and me the waste of valuable time, money and useless worry. I never worry. When I go to bed, the cares of the day are lost is sound sleep. A continuous study of theoretical and applied science is what made my financial experience possible."

Daily Routine

Unlike the majority of American businessmen, absorbed in the money getting to the sacrifice of the aesthetics, Mr. McMillin is to a surprising degree a man of varied resources. Despite his enormous interests, necessitating some 36,000 miles of travel yearly, he is always in vital touch with current art, music and letters. "How do you suppose he finds the time," was asked an eminent scholar also a prodigious worker? "Somebody reads for him, was the reply. "He couldn't do it himself. It's a physical, if not mental, impossibility."

In the daily routine of well digested policy his is the solution. He is at his desk every morning before the office boy arrives. He adheres strictly to the fist law of nature - order. His desk is as neat as that of the daintiest woman. Night rarely finds a task undone

that the day ought to have dispatched. His home life is as well ordered as his office hours.

The Home Circle

Essentially domestic, his fine social qualities are best in his spacious and elegantly appointed home, at the Navarro, in close proximity to Central Park, where his hospitable wife, beautiful and accomplished daughter, Mrs. S. H. G. Stuart, and her clever husband, now a Wall Street broker, Miss Maude and two sons, the youngest a freshman at Yale, dispense royal good cheer.

The spacious home of 24 rooms reflects both the habits and the tastes of the man. A lover of "art for art's sake," wealth enables him to indulge his taste to the extent of a private art gallery. Each picture is to him a never-failing source of pleasure. It is after midnight when all the household is asleep that he communes with these pictorial friends and accomplishes the reading variously attributed to an assistant. He has the catalogues of every notable collection, every art sale. He knows the biography and the school of each painter, and the prices brought at all important sales. A splendidly equipped library is another fountain of inspiration from which he drinks knowingly.

Wealth a Trust

While personally enjoying to the utmost the fruits of his labor, there are perhaps few men who feel more conscientiously the responsibility wealth imposes.

"I have never had the ambition to be rich," he once said. "I can't say that I ever entered upon any undertaking with the thought of how many dollars it would bring me personally. I, of course, take up only those things that I believe are worth my time, and then have the ambition to make them a success for the sake of success, rather than for the money that is in it. I am not proud of the fact that I have been able to make more money than the average man of similar environment. But I am proud that I have been industrious and that I had the energy and the capacity to equip myself mentally in such a way as to command positions of high remuneration." To aid others less fortunate than himself is his constant solicitude. He is never too busy to lend a helping hand, a sympathetic ear to the cry of distress, while in his quick discernment of merit he is ever ready to advance the fortunes of the deserving.

"It is my purpose to make a disposition of my surplus as I go through life, leaving whatever I may possess at death entirely to my family. I don't think," he said, "that there is anything very liberal in a man hanging on to the last dollar until he dies, with a provision in his will giving away that which he can no longer use. Then I want the pleasure and happiness that may be derived from disbursing the little surplus for which I work."

The Ohio State University in its law library, the Museum of Orton Hall and the Emerson McMillin Observatory bear witness no less than the Columbus Art School, the Y.M.C.A. library and numerous educational and charitable institutions, to his substantial appreciation of educational needs and possibilities, and the "ineffable blessing" this gifted and public-spirited Buckeye finds in showing the rewards of his labor.

Appendix 2

The McMillin Fellowships

"Because of the Observatory, he was destined to take graduate degrees in a science that he had not contemplated, and to become not only a noted professor in the University but also to be acting dean of the College of Engineering for five years. Coddington was living at the South Dormitory and supporting himself in college by delivering the morning *Ohio State Journal* in downtown Columbus. He would rise very early, and, because the street cars had not started to run, would walk more than two miles to the center of the city and then do additional walking to deliver his papers. He would then ride the car back to the campus and go to class. He fell asleep in Prof. H. C. Lord's astronomy class. In his apology he explained his early morning work. "Suppose you quit your newsboy job," suggested Lord, "and help me get the equipment of the Observatory in working order." He did, and the University financial report for 1895-96 lists E. F. Coddington as janitor of the McMillin Observatory at $240 for the year. In setting up and adjusting the equipment, Coddington became thoroughly familiar with it, more so, even, than Professor Lord. Dedication ceremonies of the Observatory were held at Commencement the 15th of June 1896, when Coddington received the degree of Civil Engineer. A letter from Emerson McMillin announced establishment of a graduate fellowship for study of astronomy. Without consulting Coddington, Professor Lord stated that the first McMillin fellow would be E. F. Coddington. So, instead of having a career as civil engineer or land surveyor, Coddington spent a year as "resident graduate" in the College of Arts, Philosophy, and Science and received the M.Sc. degree in 1897. He spent a few years at the Lick Observatory in California, and then, with the aid of Mr. Julius Stone, amateur scientist and long-time member of the Ohio State University Board of Trustees, attended the University of Berlin where he achieved the Ph.D. in astronomy in 1902. That year he came to Ohio State to teach mathematics, taking the place of an assistant professor who was on leave for graduate work. In 1910, Mr. Emerson McMillin paid the expenses of Professors Lord and Coddington to Hawaii to observe Halley' s Comet." (Quoted from *The College of Engineering in the First Hundred Years of The Ohio State University* by J. Merrill Weed, September 1969.)

Much of Coddington's astronomical work related to determining the orbital elements of asteroids and comets. On June 11, 1898 Mr. Coddington, while working temporarily at Lick Observatory, discovered a comet on a negative plate taken of the Antares region two nights before. A visual telescopic observation on the

evening of the 11th confirmed his suspicion. The comet was independently discovered on June 14 by Pauly observing from Bucharest, Rumania. Never a naked-eye comet, comet Coddington-Pauly was labeled 1898 VII (C/1898 L1).

Coddington would also make significant contributions to the study of both comets and asteroids. In subsequent years he would discover asteroids (439) Ohio, (440) Theodora, (445) Edna, and provided observations of Comet 1898 VIII (Chase) from which orbital elements were worked out. He also discovered a dwarf spiral galaxy in Ursa Major that is today known as Coddington's Nebula (IC 2574). Coddington would also made significant contributions to the study of double stars, all while in residence at Lick Observatory in California.[120]

Any comments or questions about the history of Emerson McMillin or his astronomical observatory may be addressed via e-mail to: *carlwenning@gmail.com*

[120] Coddington, E. F., *Publication of the ASP,* XI, (1) 47