

Chapter 2

Swift Steps into Astronomy

As indicated in the previous chapter, Swift's interest in astronomy was slow to develop, despite the occasional observation of impressive events. But things began to change in 1854. Swift said the following in a 1912 interview,

... a book seller came into the store one day and I asked him if he had Dr. Dick's work on astronomy. He replied in the negative, but told me he would get them. One year later he brought the two volumes. In reading them I became so entranced in the subject that I decided to make astronomy a life study.¹

This is the most complete account of what happened; however, there were earlier interviews that reveal a slight difference in the books he received. An 1878 newspaper article states the following:

From his father he inherited quite a taste for literary and scientific pursuits. At an early age this was greatly strengthened by reading the works of Dr. Thomas Dick, which were so popular thirty and forty years ago. 'Celestial Scenery,' in particular, had not a little to do in making him an astronomer.²

The following was said in an 1883 article: "It was as far back as 1855 that Mr. Swift purchased a complete set of Dr. Dick's works, several of which were purely astronomical. We do not learn that he bought them because of the astronomical volumes; he was not then specially interested in the stars."³

Thomas Dick was a Scottish minister and science teacher. If Swift did purchase Dick's complete works, these included books connecting science and religion, written in the 1820s, a book about the moral improvement of mankind, written in 1836, and books on astronomy written between 1837 to 1845. *Celestial Scenery, or the Wonders of Heavens Displayed*, written in 1837, mostly described the various bodies in the Solar System, while *The Practical Astronomer*, written in 1845, goes into

¹Lewis Swift, "Astronomer, Who Has Quadriennial Birthdays, to Be 92, or 22, on February 29th," *Rochester Democrat & Chronicle* (1912 Feb. 4), p. 22, col. 6.

²"A Rochester Star-Gazer," *The Rochester Evening Express* (1878 Jun. 8), p. 1, col. 3.

³"Dr. Lewis Swift," *The Marathon Independent* (1883 Nov. 7), p. 4, col. 5.

Fig. 2.2 Lewis Swift
(Photo courtesy of the
Rochester Historical
Society)



great detail on light, lenses, telescopes, and various astronomical instruments. The latter book was probably the guide Swift used to build his first telescope.

Swift also bought Elijah Hinsdale Burritt's *Atlas Designed to Illustrate the Geography of the Heavens*, which he would frequently use to plot the "nebulae" he would find while hunting for comets during the next two decades.

Swift began working on his telescope in 1856. He bought a 3-inch achromatic object glass for \$5, which suffered from a streak. The glass was bought from Charles A. Spencer, the celebrated manufacturer of microscopes and telescopes in Canastota, New York. Swift said the lens had no cell, so "I made one out of a brass buggy hub band. Making a tube, a stand and an eyepiece."⁴ Swift said he, "commenced the examination of the heavens, this being my first view of celestial objects through a telescope. The pleasure however was of short duration, as a careless servant girl broke the crown lens,"⁵ which was the primary glass of the telescope (Fig. 2.2).

⁴"Lewis Swift, Astronomer, Who Has Quadriennial Birthdays, to Be 92, or 22, on February 29th," *Rochester Democrat & Chronicle* (1912 Feb. 4), p. 22, col. 6.

⁵L. Swift, "Ups and Downs, and Here and There of an Astronomer," *Popular Astronomy*, 9 (1901 Nov.), pp. 176–477.

Swift had seen enough with this small telescope, and it inspired him to see more. So, he ordered a 4½-inch comet seeker, which was a refracting telescope, from Henry Fitz in New York. Fitz had an excellent reputation for creating fine optics, and the telescope arrived just as the great comet Donati had been discovered, which was in early June 1858. Swift wrote, “I mounted my equatorial on a stone pier and built an observatory with revolving roof at Hunt’s Corners, which was one of the first, if not the first, in the state.”⁶ Comet Donati became the first comet that Swift ever studied, and it led to his first published comet observation. In a letter to the *Astronomical Journal*, he described the appearance of the comet on the evening of October 9, 1858:

*I noticed what seemed to be a multiple appearance of its tail. The tail was distinctly though faintly visible to [the star Eta] Herculis, and considerably curved, the curve of the concavity differing from that of the convexity. The tail, for about 5° from [Eta] Herculis, seemed divided into several parts; or, rather, there were visible three dark stripes, some 5° in length, and near the center, the middle one being most conspicuous. By looking a little to one side, I fancied that I could see five. I am describing the appearance to the naked eye. I observed the same appearances the following evening, but they were not so striking.*⁷

Swift stated that he was the postmaster of Hunt’s Corners, a title that is confirmed by a U. S. post office document published in 1859.⁸

Swift left the store in 1860,⁹ and he and his family moved to the village of Marathon in Cortland County. According to the U. S. census, they were living with his wife’s parents, Asa and Sarah Hunt, in June. The census taker gave Swift’s occupation as “Traveling lecturer.”¹⁰ Although nothing more specific was given, it just might have involved the microscope with his cousin Edwin mentioned at the end of the last chapter.

Swift noted that, after moving to Marathon, he could not find a good place to build a new observatory, so he “cut a hole through the gable of my barn to crawl through, and built a platform on which to observe.”¹¹

Swift continued to methodically hunt for comets for the next 2 years, steadily sweeping the telescope back and forth across large areas of the sky each night. Although he finally met with success, it ended up being by accident.

⁶“Lewis Swift, Astronomer, Who Has Quadriennial Birthdays, to Be 92, or 22, on February 29th,” *Rochester Democrat & Chronicle* (1912 Feb. 4), p. 5, col. 6.

⁷L. Swift, “Appearance of the Great Comet of 1858,” *The Astronomical Journal*, **5** (1858 Nov.), p. 176.

⁸*List of Post Offices in the United States*. Washington: John C. Rives (1859), p. 74.

⁹*History of Cortland County*, ed. H. P. Smith (Syracuse: D. Mason & Co., Publishers, 1885), pp. 443–444.

¹⁰“United State Census, 1860,” Marathon, Cortland County, New York; p. 508, family 380, dwelling 386, lines 31–32; June 30, 1860; National Archives Microfilm M653, Roll 739 (Washington, D. C.: National Archives and Records Administration, 1900).

¹¹L. Swift, *Popular Astronomy*, **9** (1901 Nov.), p. 477.

Comet Swift-Tuttle: Swift's First Comet Discovery

While reading the July 8, 1862, issue of *The New York Times*, Swift saw a story about the discovery “of a comet in the Northern heavens, about 14 degrees to the northeast of the pole-star.” The motion was described as “exceedingly rapid.”¹² The story was referring to a comet that Johann Friedrich Julius Schmidt, an astronomer at Athens Observatory (Greece), had discovered on July 2.

Several days of poor weather followed, but July 15 was clear. In an article written many years later, Swift said:

*As soon as it was dark I took my comet-seeker to a neighbor's back yard and in less than five minutes I ran across a beautiful comet apparently north east of the north star, which I took for granted, as everybody would, that it was the comet I was searching for. The next morning I told the people of the village that I had found the new comet*¹³

Swift had taken notice of the comet's position with respect to several stars and wanted to re-observe it the next night to “ascertain what astronomers meant by saying it is moving very fast” In the same story, he continued,

*The next night I expected a long search for it, as the Times did not state in which direction it was moving, and a near-by barn obstructed much of my view in a northeast direction. Pointing the telescope ... to the place of the comet on the previous evening, the comet was not seen, but was in a moment found nearby, having moved but little, which surprised me, but still no suspicion was entertained that it was another comet.*¹⁴

A few days later, Swift was reading the July 22 issue of *The New York Times* when he saw that Horace Parnell Tuttle, an astronomer at Harvard College Observatory (Massachusetts, USA), had discovered a comet northeast of the North Star.¹⁵ He immediately wrote a letter to George Phillips Bond, of Harvard College Observatory, providing the details of his observation, but added, “I thought it strange that a comet moving as fast as that was represented to move should still be only some 30° of Polaris, but as it had no tail & the one I was searching for also had none, I became gradually convinced that it was not a new one.”¹⁶

Bond wrote back to Swift on August 8, stating the following: “The account given of the position of the object seen by you on the 15th July is not definite enough to decide the question of identity with the comet of the 18th. If you have the data for fixing the place definitely I should be glad to know of it and shall be able then to speak with certainty.”¹⁷

¹² *The New York Times* (1862 Jul. 8), p. 4, col. 2.

¹³ L. Swift, *Popular Astronomy*, 6 (1898 Sep.), p. 417.

¹⁴ L. Swift, *Popular Astronomy*, 6 (1898 Sep.), p. 417.

¹⁵ *The New York Times* (1862 Jul. 22), p. 4, col. 2.

¹⁶ L. Swift correspondence with G. P. Bond (1862 Jul. 22). Courtesy of the Harvard University Archives.

¹⁷ G. P. Bond correspondence with L. Swift (1862 Aug. 8). Courtesy of the Harvard University Archives.

Swift wrote to George Washington Hough, the director of Dudley Observatory (Albany, New York, USA), on August 11, explaining the details of his observation and including the fact that he did not determine a position. Swift responded back to Bond on August 18, basically stating that he was unable to determine a position with any accuracy. Although there was apparently no further correspondence between Swift and Bond on this matter, Hough was definitely intrigued.

Hough wrote back to Swift and asked for a "diagram of the position of the Comet, with reference to a star near it, which he saw in the field of the telescope at the same time." Hough also requested the diameter of the telescope's field of view. Almost immediately upon receiving Hough's letter, Swift sent the requested information.

Hough was able to identify the star and determine a position for July 16. The position derived from the diagram matched the expected location of Tuttle's comet. Hough sent these details to the *Albany Evening Journal*, writing, "As there is no reason to doubt the authenticity of the observation, the honor of first discovery undoubtedly belongs to Mr. Swift."¹⁸ Beginning on August 22, several newspapers carried the story that Swift had discovered the comet.¹⁹

In a book published by Harvard in 1863, it is stated that Harvard College Observatory received a communication from Swift, which said "a comet was seen by him on the 15th in the neighborhood of the place of this comet, but was mistaken for the Comet 1862 II." It continued that although a position was not measured "with certainty enough to establish its identity with Comet III, ... it is not unlikely that they were the same."²⁰

This comet was eventually named "Swift-Tuttle." It was observed for about three and a half months and reached naked-eye visibility in August, with a tail that could be traced to more than 20° with optical aid.²¹

Interestingly, the story of this comet's discovery was not completely settled, and an intense discussion occurred 36 years later in the pages of *Popular Astronomy*. The discussion began with an innocent story published in June called "Comets and Comet Families," in which William Wallace Payne noted the possibility of using comet families as a method of finding further planets. At one point he writes the phrase, "Comet III 1862, which is known as Tuttle's comet"²²

Swift sent a letter to *Popular Astronomy* on August 10. He started off with, "In your interesting and instructive articles on Comet Families, you have fallen into an error in ascribing the discovery of this comet to Tuttle." He then provides all of the facts, which generally match what is given above. Near the end of the letter he adds,

¹⁸G. W. Hough, "Discovery of the Second Comet of 1862," *Albany Evening Journal* (1862 Sep. 13), p. 2, col. 3.

¹⁹*The Tiffin Weekly Tribune* (1862 Aug. 22), p. 2, col. 6; *Fremont Journal* (1862 Aug. 22), p. 1, col. 6.

²⁰Report of the Committee of the Overseers of Harvard College Appointed to Visit the Observatory in the Year 1862 (Boston: Press of George C. Rand & Avery, 1863), p. 18.

²¹G. W. Kronk, *Cometography*. Volume 2. Cambridge (England): Cambridge University Press (2003), pp. 307–313.

²²W. W. Payne, "Comets and Comet Families," *Popular Astronomy*, 6 (1898 Jun.), p. 230.

“Any way I am glad you have called the comet something, even if you did get the name wrong. It was one of the finest comets of the century” Swift’s letter contained one extra piece of information that had never before been published. He said the comet was displaying “a short tail” when discovered.²³

The November issue of *Popular Astronomy* included a letter from Tuttle. He started out, “Lewis Swift, if the writer reads his remarks correctly, claims to be the original discoverer of Comet III, 1862. He states that a comet which he saw on the evening of July 15th had a *tail*.” Tuttle continues,

*Now, let us look ‘at the other side of the case.’ The comet which the writer discovered at the Harvard College Observatory on the evening of July 18th, 1862, had no tail nor any sign of one at that time, neither in the 4-inch comet-seeker nor in the 15-inch telescope. The field of view in the comet-seeker was over three degrees and in the equatorial one quarter of a degree. Had there been the slightest trace of a tail on that evening either myself or Professor Bond would have certainly seen it.*²⁴

Tuttle added that Bond saw the comet “less than ten minutes after the writer first observed it” He continued, “If the comet seen by Swift on July 15th was the same one that was observed at Cambridge on July 18th, and its *position in right ascension and declination accurately recorded*, what had become of its ‘tail’ in the mean time?” The italics are Tuttle’s and certainly take a dig at Swift for not precisely measuring the comet’s position when discovered.

Asaph Hall, a colleague of Tuttle at the time of this comet discovery, wrote to Tuttle on October 20, 1898, and gave Tuttle permission to send his letter to *Popular Astronomy*. Hall stated:

*My memory of your discovery of comet III, 1862, had nearly faded out, but I have been up to the Harvard Observatory and looked at the observing book. You found this Comet July 18th, about 10:00 p.m. I made the first observations and you recorded for me on that date. No tail was seen by any one until some time after this discovery. Is it probable, therefore, that the Comet found by Professor Swift, on July 15th, suddenly drew in its tail, and disappeared into the limbo of unknown comets? I am glad that you are living to vindicate your rights.*²⁵

Swift was insulted by the sarcastic replies of Tuttle and Hall. He felt that they made an “indirect insinuation that I have attempted to palm off on the astronomical world a fraudulent discovery.”²⁶ however, they both had a good point, as Swift’s very first letter to Bond on July 22, 1862, specifically said that the comet had no tail. This was a concern to them that Swift now claimed, for the first time ever, that the comet had a tail 36 years after the observation was made.

Swift responded with a letter that was published in the December issue of *Popular Astronomy*. He indicated that the tail was extremely faint and “would have been overlooked by nine astronomers out of ten. I am willing to admit however that

²³ L. Swift, *Popular Astronomy*, 6 (1898 Sep.), pp. 416–417.

²⁴ H. P. Tuttle, *Popular Astronomy*, 6 (1898 Nov.), p. 535.

²⁵ A. Hall, *Popular Astronomy*, 6 (1898 Nov.), p. 535.

²⁶ L. Swift, *Popular Astronomy*, 6 (1898 Dec.), p. 563.

it may have been imaginary so faint was it but I am inclined to think it was real. That they did not see it proves nothing.”²⁷

Hall came back with a response. He said Swift was “... naturally indignant at the supposed charge of cooking an observation, but his long and useful career in astronomy will surely protect him from charges of this kind. Still we all make mistakes, and Professor Swift’s statements bring to mind a common habit of proving too much”²⁸

To support the latter statement, Hall then brought up how Swift had altered details of his supposed discovery of a new planet in 1878 to better align his observations with those of Watson [see Chap. 4]. Swift simply responded, “My rejoinder to his remarks on the intra-mercurial planet question, which he injudiciously calls Vulcan, will be reserved for another occasion.”²⁹

Also in the December issue of *Popular Astronomy*, William Frederick Denning put in his two cents worth. He said he had always “ascribed the discovery of 1862 III to Swift, but ... the real facts of the case were unknown to me.” Denning continued:

*Swift saw the comet first, but he did not know it was new and therefore the mere fact of his seeing it constituted no discovery at all! He says he entertained no suspicion that the object was an entirely new comet until it was announced as such by Tuttle. I believe that in such a case priority of announcement should invariably be held synonymous with priority of discovery. To discover an object a man must not only see a thing but recognize that it is new by proper tests and references and announce it to the world.*³⁰

Denning did admit, “In regard to Comet 1862 III the mistake of Swift was natural enough under the circumstances and many of us would have made it.”

Swift sent a shorter response to *Popular Astronomy* on January 5, 1899, which included the following:

*Now I am done with this comet controversy except to say I have expressed no desire for posterity to consider me as being the discoverer, but only that I discovered it three days before Professor Tuttle did, and to defend my good name against the foul aspersion that I was promulgating a falsehood, which with me never goes unrebuked.*³¹

More Life Changes

Swift’s life experienced some changes during 1863 to 1870, beginning with the death of his wife, Lucretia, on September 5, 1863.

²⁷ L. Swift, *Popular Astronomy*, 6 (1898 Dec.), p. 563.

²⁸ A. Hall, *Popular Astronomy*, 7 (1899 Jan.), p. 13.

²⁹ L. Swift, *Popular Astronomy*, 7 (1899 Feb.), p. 104.

³⁰ W. F. Denning, *Popular Astronomy*, 7 (1899 Jan.), pp. 15–16.

³¹ L. Swift, *Popular Astronomy*, 7 (1899 Feb.), p. 104.

Swift remained a widower for less than a year, as he married Caroline Doane Topping on August 24, 1864. The marriage took place at the home of Captain Edward Doane Topping at East Moriches, Long Island, New York.³²

Caroline gave birth to Lewis Swift, Jr., in 1865 and Ralph Forbes Swift in 1867. Unfortunately, Ralph died just 5 months later. Another son was born near the end of 1870. Swift and his wife named him Edward Doane Topping Swift, after Caroline's father.

Swift's older brother William died in 1868. He was hunting with some friends about 60 miles from San Francisco in late November when he got separated. His friends expected he would show up at the camp that night, but he did not. They began searching for him the next day, but William was not found. The *San Francisco Bulletin* reported that someone did find William on Thursday, November 26, after having been lost for three days, and "directed him to the house of a Portuguese, where he remained until Saturday." The *Bulletin* continued, "He was directed to the right road for the depot. Some one found him subsequently going in an opposite direction, and from his conversation thought he seemed to be in liquor, though subsequent events showed him to be crazed."³³

William was found dead on Sunday, November 29. He was lying in a small valley, having died from exposure.

Swift's First Interview

Swift would be interviewed dozens of times in his life, but what appears to have been the first can best be described as odd for a couple of reasons. First, it was written in what was rather a silly style for a newspaper. Second, Swift was pretty much unknown at the time of the interview in July 1866, so why would a newspaper in Ohio be interested in him? Was it because of the one comet he had discovered 4 years earlier? Unfortunately, an answer to these questions does not seem to exist.

Anyway, a reporter for the *Cleveland Daily Leader* spent time with Swift in early July. The resulting story was picked up by several other Ohio newspapers and published during July and August. The reporter continually referred to the telescope as a "stove pipe." Saturn was the first object that Swift showed the reporter, noting that it had eight moons. The reporter commented, "But we guess seven of 'em had gone to celebrate the Fourth of July, as but one was visible." Jupiter was the next object examined. Swift said the two dark bands were clouds, to which the reporter commented, "But they looked suspiciously like tobacco smoke. Wonder if Jupe pays revenue on his 'vicious luxuries?'" After examining Polaris and its companion, Swift turned the telescope to some nebulae. The reporter said that these "had the appearance of German silver spoons dipped in Allopathy medicine" to the naked eye, while the telescope revealed "large nests of stars' eggs, some of which were

³²"Marriages," *The Evangelist* (1864 Sep. 1), p. 5, col. 2.

³³"Died in the Mountains," *San Francisco Bulletin* (1868 Dec. 03), p. 3, col. 3.

newly hatched. Would make a splendid dress for an evening party.” After examining some double stars, Swift turned the telescope to the Milky Way, to which the reporter commented, “the recent thunder showers had soured the milk, and a good view could not then be obtained.”³⁴ There is much more to the article than is presented here and, in spite of the “humor,” it does illustrate Swift’s early thoroughness in showing people the night sky.

The Solar Eclipse of 1869

Swift wanted to see the total solar eclipse of August 7, 1869, and it just so happened that his friend Hough was heading up one particular eclipse party that was heading to Mattoon, Illinois. Swift contacted Hough and officially became a member of this group.

Swift left a few days early, taking a train that passed through Elkhart, Indiana, where his brother Dean lived. He spent several days with Dean and his family. On the night of July 31, Swift set up his 4½-inch comet seeker for them and other citizens of the town. A local newspaper wrote the following:

*Lewis Swift, Esq., a brother of Dean Swift, of this place, last week honored our sanctum with his presence. Mr. Swift is an astronomer of considerable renown, from Genesee Co., N. Y. He was on his way to Mattoon, Illinois, where he proposes taking observations of the eclipse. On Saturday evening he mounted his powerful telescope, and with others of our citizens, we had the pleasure of ‘star-gazing’ under his intelligent direction. It was a very rare treat and one for which we feel exceedingly grateful.*³⁵

Swift met Hough’s group in Mattoon a few days later. They set up their equipment in preparation for the big event. Three minutes prior to the predicted beginning of the eclipse, Swift sat down and began peering through his telescope, “confident that the eclipse would not be five seconds too late or too early.” He added,

*The three minutes to wait passed slowly, as if time had begun to retard its motion. The last tick of the third minute passed, and nothing like an eclipse was visible; but, before the next tick, three mountain peaks of the moon were visible on the edge of the sun’s disc like fine points. The eclipse was just three fourths of a second too late!*³⁶

Swift later told a group of people attending one of his lectures that this was “the greatest sermon on faith that was ever preached to him.” Shortly before the end of totality, he decided to gaze at the totally eclipsed Sun with just his eyes “and found it to be one of unutterable grandeur.”³⁷

³⁴“Astronomical Observations,” *The Hancock Jeffersonian* (1866 Jul. 20), p. 3, col. 5–6.

³⁵*Elkhart Truth* (1869 August 5), p. 3, col. 1.

³⁶“The Wonders of Astronomy,” *The Rochester Evening Express* (1878 Apr. 3), p. 2, col. 5.

³⁷“The Wonders of Astronomy,” *The Rochester Evening Express* (1878 Apr. 3), p. 2, col. 5.

Following the eclipse, Swift headed home, where he wrote up his report and sent it to Hough on August 12, 1869. Swift wrote that as soon as the Moon began to pass in front of the Sun, he noted the following:

*For about two seconds after the contact that portion of the sun covered by the moon was bounded by a straight line, instead of a curve, as I expected it would and ought to be. A little to the right of the point of contact were five lunar mountains. I distinctly saw them enter on the solar disk, looking like the straight edge of a saw, whose teeth were worn to bluntness.*³⁸

A moment before the Sun was totally eclipsed, Swift “saw that never to be forgotten protuberance sitting in queenly beauty on the crest of the sun. The color was much brighter, the size much larger, and altogether much more conspicuous than any I expected to see. In fact, I was so captivated with its wonderful unexpected beauties, as to amount to a perfect fascination.” At totality, Swift noted “seven or eight” protuberances. He then added, “The internal structure of the great protuberance was remarkable. It appeared to me to be interlaced with long narrow black stripes crossing each other like irregular lattice work. To my eye, from first to last, this feature of it was one of its distinctive characteristics.”³⁹

He added, “It looked like a ship with her hull, masts, spars, etc., painted red, and the ropes painted black. It also looked like a red, *inverted* capital W, interlaced with fine black lines.” At least one other observer also compared it to a ship. Ultimately, Swift and Hough made several precise timings of various phenomena seen during the eclipse.⁴⁰

A New Comet: Almost

Swift found another comet on the evening of April 15, 1871, during a routine comet hunting session with his 4½-inch comet seeker. He immediately sent a letter to the *The Syracuse Daily Journal*, which became one of the first newspapers in the country to announce the discovery. Swift wrote:

*I have the pleasure of stating that I have this evening discovered a telescopic comet in the constellation Perseus, nearly in the same field with Alpha, the brightest star in the constellation. Its position at 9 hours 10 minutes, local time, was about Right Ascension 3 hours 10 minutes, declination north 49 degrees 35 minutes. It has a tail 10 minutes in length, and is moving at the rate of about 35 minutes per day towards Capella.*⁴¹

³⁸L. Swift, “Total Eclipse of August 7th, 1869, observed at Mattoon, Illinois,” *Transactions of the Albany Institute*, 6 (Albany: J. Munsell, 1870), pp. 197–198.

³⁹L. Swift, “Total Eclipse of August 7th, 1869, observed at Mattoon, Illinois,” *Transactions of the Albany Institute*, 6 (Albany: J. Munsell, 1870), p. 199.

⁴⁰G. W. Hough, “Total Eclipse of August 7th, 1869, observed at Mattoon, Illinois,” *Transactions of the Albany Institute*, 6 (Albany: J. Munsell, 1870), p. 185.

⁴¹L. Swift, “Discovery of a Comet,” *The Syracuse Daily Journal* (1871 Apr. 17), p. 4, col. 2.

Swift also sent a telegram to Dudley Observatory (Albany, New York) on the 16th and sent a letter to the U. S. Naval Observatory (Washington, D. C.). These two observatories confirmed the comet on April 18 and April 20, respectively, at which time they announced Swift's discovery.⁴²

As things turned out, Swift was only the first person in the United States to find the comet. Shortly after the announcement, word arrived from Europe that the comet had been discovered by Friedrich August Theodor Winnecke (Karlsruhe, Germany) on April 7, while an independent discovery had been made by Alphonse Louis Nicolas Borrelly (Marseille, France) on April 13. The comet became known as "Winnecke."

Observing Meteor Showers

As mentioned in the previous chapter, Swift witnessed the great Leonid meteor storm of 1833, which was one of the early events that would ultimately nudge him toward a career in astronomy. For the most part, he did not spend a lot of time looking for meteors, once noting that he watched for them when he needed to relax his "wearied eye" from comet hunting.⁴³ His most active period of observing meteors came during 1865 to 1872, during which time he sent several reports to the *American Journal of Science and Arts*.

Swift saw the return of the Leonid shower on the night of November 13/14, 1865. From evening twilight until 10:00 p.m., he saw no more meteors than usual; however, he resumed observations at 5:00 a.m. and saw 47 in 45 min. Swift said that he traced the paths of 44 backwards and found that they converged near a position of $\alpha = 10^{\text{h}} 00^{\text{m}}$, $\delta = +25^\circ$, which is within the "sickle" of the constellation Leo. He said that most of the meteors left "trains of unusual length and distinctness" and, "An unusual number were visible near the horizon."⁴⁴ A meteor train is the luminous ionization trail left after a meteor burns up in the atmosphere.

The annual Perseid meteor shower was observed in August 1867. Swift reported seeing 39 meteors during a 1 h 10 min period on the morning of August 10th, adding that 34 were conformable to a radiant in Perseus. On the morning of the 11th, he counted 17 meteors in 30 min. He said the overall diameter of the radiant was 6° to 8° . He said the meteors came from a position of $\alpha = 2^{\text{h}} 50^{\text{m}}$, $\delta = +53^\circ$ on the 10th and $\alpha = 2^{\text{h}} 55^{\text{m}}$, $\delta = +52^\circ$ on the 11th, both of which are near the "shoulder" of Perseus.⁴⁵

The Leonids were again observed by Swift on the morning of November 14, 1868. He wrote, "after half past one o'clock, [I] counted 896 meteors, all but five from Leo. At a little after three o'clock a train in Cancer was visible for several

⁴²"The New Comet," *New York Times* (1871 Apr. 23), p. 1, col. 6.

⁴³L. Swift, "Length of Meteor Showers," *Sidereal Messenger*, **3** (1884 Jun.), p. 157.

⁴⁴L. Swift, *American Journal of Science and Arts* (2nd series), **41** (1866 Jan.), p. 60.

⁴⁵L. Swift, *American Journal of Science and Arts* (2nd series), **44** (1867 Nov.), p. 427.

minutes which floated to the *north*.”⁴⁶ This particular meteor train was described in greater detail by Swift in a letter to the *Sidereal Messenger* in 1890, although he incorrectly gave the year as 1867.⁴⁷ He said the bright meteor exploded near the “southern boundary of Cancer” and left a luminous train in the sky that lasted at least 20 min. Swift watched the meteor train as it slowly moved northward. He wrote “Its changes of form were very numerous and interesting, resembling, at times, several capital letters of the alphabet, sometimes like U, then S, but more frequently like N.”

Swift said the train passed “nearly over my zenith” and then “centrally transited Præsepe,” which is a large star cluster, also known as the Beehive Cluster. The train disappeared near the northern boundary of Cancer. He explained the motion and twisting as follows:

It is highly probable that the direction of motion of the upper strata of our atmosphere is somewhat variable, though, judging from the above phenomenon, and also from that of the trade winds, I am of the opinion that north of the equator its direction of motion is generally northward, and, but for the rotatory motion of the earth, would be undeviatingly so.

Swift saw the Andromedid meteor shower on the night of November 27/28, 1872. Between 9:00 and 11:00 p.m., he specifically observed meteors for 1.5 h. A total of 51 were seen, with all but one radiating from the region of Gamma Andromedae. Swift said most of the meteors were “small,” indicating that they were faint, “and moved more slowly than ordinary meteors.” No meteors were seen the next night.⁴⁸

Swift next observed a meteor shower on December 12, 1876. He was comet hunting and soon noticed an unusually strong display of meteors. Edwin F. Sawyer provided the details in his monthly column on meteors for *Science Observer*. He wrote that Swift’s estimates indicated an average rate of over 50 per hour from 2:30 a.m. until daybreak. Sawyer suggested that “from his description it must have been the Geminids with maximum on or about this date.”⁴⁹

A reporter for the *Rochester Democrat and Chronicle* was inspired to interview Swift after seeing meteors from the Perseid meteor shower in August 1880. So, on the evening of August 14, he walked into Swift’s hardware store and found him eager to talk about the subject.

With respect to the cause of meteor showers, Swift said,

It is pretty well established that they originate from comets. Countless ages ago when the comets first came into the region of our solar system in circulating round the sun, they left particles from their tails in their orbit. The amount of meteoric matter thus left was small at first, but being increased with every passage of the comet through its orbit, in time there came to be a broad and thick belt of it. These innumerable particles thrown from the comet’s tail are passing around the sun in the same orbit, and the earth in its orbit passes through

⁴⁶ L. Swift, *American Journal of Science and Arts* (2nd series), **47** (1869 Jan.), p. 125.

⁴⁷ L. Swift, “Motion of the Atmosphere at High Elevation,” *Sidereal Messenger*, **9** (1890 Dec.), p. 472.

⁴⁸ L. Swift, *American Journal of Science and Arts* (3rd series), **5** (1873 Jan.), p. 59.

⁴⁹ E. F. Sawyer, “Notes on Meteors,” *Science Observer*, **1** (1878 Feb.), p. 46.

*the belt which they form about the same time every year. Thus the periodicity of the showers is caused. But the earth does not pass through at the same place every year, which gives rise to the difference in the number of shooting stars observed from year to year.*⁵⁰

Swift continued by noting that the comet responsible for the Perseid meteor shower of August was the one he discovered in 1862 that is now known by the name “Swift-Tuttle.” He added that some meteor belts are thinner than others because their parent comets have traveled in this orbit a fewer number of times. In addition, Earth sometimes intercepts meteor belts in a perpendicular manner and sometimes in an oblique manner, the latter of which can cause the shower to last for several weeks. Swift said meteors seen through a telescope are “as small as a grain of wheat,” while those seen with the naked eye “are probably about the size of marbles.” He noted that no meteor from a shower has ever reached Earth and that meteors that do reach Earth have an entirely different origin. He stated, “These larger meteors are supposed to be independent bodies with independent orbits, which, coming within the attraction of the earth, are drawn toward us, and ignited by friction with the atmosphere.”⁵¹

⁵⁰“Celestial Fire Works,” *Rochester Democrat and Chronicle* (1880 Aug. 15), p. 4, col. 7.

⁵¹“Celestial Fire Works,” *Rochester Democrat and Chronicle* (1880 Aug. 15), p. 4, col. 7.

Lewis Swift

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