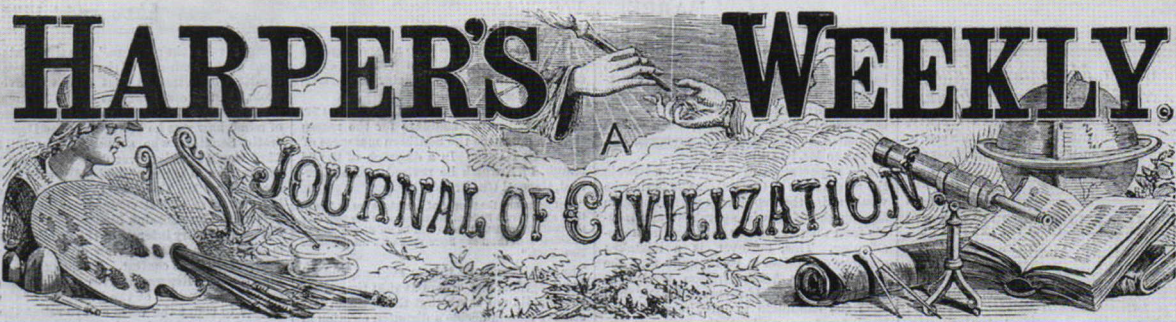


HARPER'S WEEKLY.

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THE GREAT SOLAR ECLIPSE.—SKETCHED AT SNAKE RIVER PASS, COLORADO, BY ST. GEORGE STANLEY.—[SEE PAGE 675.]

The cover of Harper's Weekly on August 24, 1878, featured St. George Stanley's illustration of a rare and spectacular event that had thrust the young state of Colorado into the scientific community's sights: a total solar eclipse visible from Colorado's mountains and plains. As with most major astronomical phenomena of the day, the eclipse was a social sensation as well, bringing tourists and other nonscientists into the state and out of doors to gaze into Colorado's skies.

“AMONG THE FAVORED MORTALS OF EARTH”

The Press, State Pride, and the Eclipse of 1878



he year 2008 marks the 130th anniversary of the total solar eclipse of 1878. A closely watched event, the eclipse held significance to the science of astronomy, the American West, and Colorado in particular. Total solar eclipses are extremely rare events, and wherever they occur they cause a sensation. In the nineteenth century astronomers chased these eclipses all over the world—to Asia, Africa, and the middle of the oceans.

When it was publicized that such an eclipse would occur on July 29, 1878, over the Rocky Mountains, Coloradans' excitement was unanimous. Just two years old, the state would have a chance to showcase itself as renowned scientists and hordes of tourists flocked to its mountains and cities: The whole world would watch the eclipse through Colorado's eyes.

In 1876 a small news item in a Denver paper may have been the first indication that two years hence an awesome natural spectacle would take place in the skies above Colorado. The March 27, 1876, *Denver Times* reported that in July 1878 a total solar eclipse would pass over the state. The paper even claimed—with evident pride—that “it does not appear that [the eclipse] will be total at any other city now existing in the United States.”

Most Coloradans were probably unaware that they would be hosting a major scientific event until the beginning of 1878, when other Colorado papers began reporting on the upcoming phenomenon. On January 26, the *Silver World* of Lake City briefly noted that the eclipse would occur over Colorado in July. By March, word was starting to spread. The *Denver Tribune* ran a short piece noting the advantage that the state would afford observers:

Colorado will have a special attraction the coming summer in the eclipse that has been appointed for July 29. [It] ought to attract hither large numbers of astronomers. We don't know a great deal about eclipses; but should suppose there would be special advantages in observing them from high altitudes. And Colorado will afford as high altitudes for observing . . . as the most exacting astronomers could ask, and enough of them to accommodate all the astronomers in the country. Long's,

BY STEVE RUSKIN

Gray's, Pike's and James' peaks will all be included in the total belt [i.e., the path of the eclipse]. And there are within the same belt innumerable other peaks less noted but nearly as high. Each one of the rival astronomers can have a peak to himself.

By April newspapers across the state were publishing the exact time that the eclipse would begin. Colorado was ready, and had promised each visiting astronomer a private mountaintop. But would the astronomers come? Eclipse expeditions were not cheap, and the federal government had still not appropriated the funds necessary to bring astronomers out west.

Transit and Eclipse.

The transit of Mercury, which occurs on the 6th of May, will begin, Denver time, at 8:12 a. m., and end at 8:45 p. p. The eclipse of the sun, occurring on July 29, 1878, will be, by Denver time, as follows:

Eclipse begins.....	2:16 p. m.
Totality begins.....	3:30 p. m.
Totality ends.....	3:33 p. m.
Eclipse ends.....	4:31 p. m.

On April 30 the Gilpin County Evening Call reported the anticipated duration of the upcoming solar eclipse.

The *Tribune* of April 20 complained loudly that the coming eclipse—perhaps one of the most significant scientific events in the country's history—was being overlooked in Washington because it was occurring in the western states and territories. The *Tribune* even suggested (rather snidely) that congressmen would rather ogle women than help the scientific community observe an eclipse:

Congress has as yet made no appropriation for the observation of the total eclipse of the sun . . . this seems to be another instance of unjust discrimination against the far West If the approaching total eclipse had been appointed for the White Mountains, for Boston, for New Orleans, for the peaks of the Virginia mountains, for Philadelphia, for Chicago . . . Congress would have treated it with proper respect and due consideration . . . and would have made ample provision for its observation. In fact, Congressmen would no more have allowed it to go unobserved than they do the handsome female lobbyists that visit their hall. But as the eclipse has been appointed for Pike's, Long's and Gray's peaks, and for Denver, Colorado Springs and Greeley, Congress does not seem to care whether any observations are made of it.

But within a few months, the Colorado press happily reported that Congress did in fact care about them. The *Pueblo Chieftain* of July 11 noted: "Congress has appropriated \$8,000" for eclipse observations. This amount was given to the United States Naval Observatory to administer and fund multiple eclipse expeditions to the Rocky Mountains. The *Chieftain* went on to describe the constitution of the various expeditions—their leaders, the astronomers who would be making observations, and the locations from which the eclipse would be observed: Creston, Wyoming; Denver and Central City, Colorado; and the summit of Pikes Peak, among others.

Although an important expedition consisting of Simon Newcomb (then director of the Navy's Nautical Almanac Office) and Thomas Edison went to Creston, Wyoming, and other astronomers went to Texas, Colorado got the lion's share of eclipse expeditions. One group made up of observers from the Naval Observatory, Johns Hopkins University, and West Point went to Central City and observed the eclipse from the roof of the Teller House hotel. Astronomers from New York and St. Louis went to Idaho Springs. Charles Young, a proponent of high-altitude astronomical observations, led the Princeton University expedition that would observe near Cherry Creek, while the budding astronomer William Henry Pickering also observed nearby. Samuel Pierpont Langley, then with the Allegheny Observatory, would scale Pikes Peak with his brother Professor John Langley and the meteorologist Cleveland Abbe. Asaph Hall, the astronomer who had just discovered the moons of Mars in 1877, would take his expedition to La Junta. Of course, all of these astronomers brought a support crew to help transport their equipment, set up instruments, and aid in other important technical aspects of the observations.

A total solar eclipse is a breathtaking sight: It lasts a few hours as the moon slowly crawls across the face of the sun. The most spectacular part of the eclipse—the brief period during which the sun is wholly obscured by the moon—lasts only a few minutes. This short period is called "totality": the temperature plummets as the disk of the sun disappears completely; the stars become visible in the middle of the day; and on the surface of the Earth a giant shadow over a hundred miles wide sweeps across the land at speeds approaching 2,000 miles per hour.



Representatives of the U.S. Naval Observatory, Johns Hopkins University, and West Point monitored the eclipse from the Teller House rooftop in Central City. Colorado mining towns' high altitude and thin atmosphere—combined with cooperative weather—allowed for prime viewing of the eclipse.

As beautiful as totality is to watch, however, scientists coming to Colorado to observe the eclipse had a specific research agenda. During totality, with no direct sunlight to blind them, the observers would be able to study the solar corona (the sun's "atmosphere"). From Colorado's higher elevations—where Earth's own atmosphere is less dense—astronomers also hoped to settle once and for all speculation that there was an undiscovered planet (known by legend as "Vulcan") that many believed would be found between Mercury and the sun, and which (if it even existed) could only be observed during totality.

Astronomers had calculated that the path of the eclipse would run down the spine of the Rocky Mountains, from southern Wyoming Territory through much of central Colorado and south into Texas. In Colorado, observers would be able to view the eclipse from estab-

lished cities (Denver and Colorado Springs), known mining communities (such as Central City and Georgetown), and small plains towns along rail lines (such as Las Animas and La Junta).

The Pennsylvania Railroad Company gave professional astronomers from Europe and the United States half-price fare from the East Coast to Denver, via Chicago or St. Louis. Other railroads offered similar discounts. And so, as the eclipse approached, astronomers arrived in Colorado by the dozens.

Perhaps the biggest disappointment in the months leading up to the eclipse was that the renowned inventor Thomas Edison chose to observe the event from Wyoming instead of somewhere in Colorado. Edison, who would be measuring the corona with his newly invented *tasimeter* (a highly sensitive heat-measuring device), decided to join



FIG. 30. — TRACK OF LUNAR SHADOW.

Samuel P. Langley's 1888 volume *The New Astronomy* included a map showing the path of the eclipse's visibility.

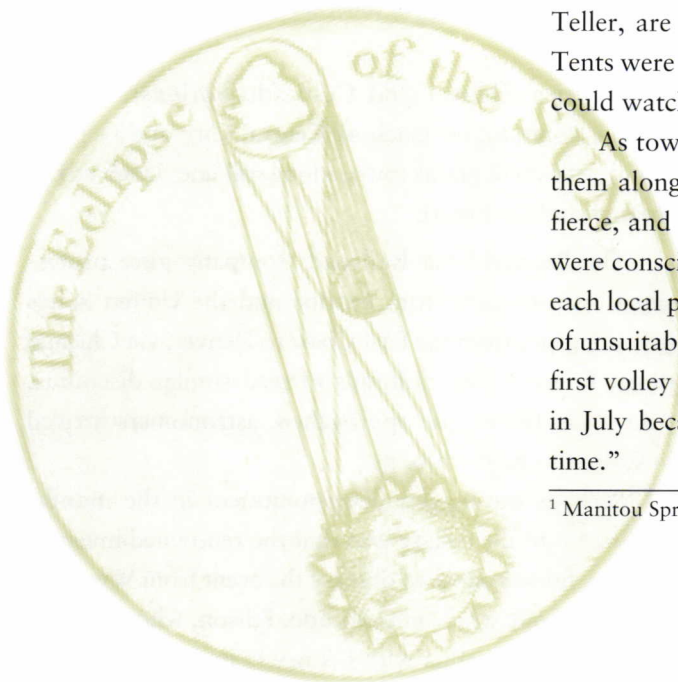
Simon Newcomb's expedition to Creston. In a July 21 article bearing the headline "Edison's Go-By," the *Denver Tribune* reported that "it has now been . . . confirmed that Professor Edison will not visit Colorado for the purpose of observing the coming solar eclipse. The *Tribune* regrets this as much as anyone can, because we were anxious that Denver should enjoy the distinction that such a visit would have given it."

Astronomers were not the only ones coming to Colorado to see the eclipse. Solar eclipses were hugely popular events, and in the nineteenth century non-scientists, especially those with financial means, would travel to locations within an eclipse path just for the sheer spectacle of watching (and being watched) during the event. In fact, the historian Alex Pang has referred to nineteenth-century solar eclipses as "the social event of the season" for their ability to attract great numbers of amateur and professional observers. After all, when an event is talked about for months or even years ahead of time, anyone who's anyone would want to be there. One posh Colorado Springs hotel is even reported to have hired an Italian band to play Beethoven for its guests during the eclipse.

Thus Colorado played host to a horde of eclipse tourists, and Colorado Springs was a particularly popular spot. In June the *Chicago Times* reported on a "mammoth excursion from the [Great] lakes to the mountains," with all those midwestern tourists heading for the Garden of the Gods. In the week before the eclipse, the weekly *Colorado Chieftain* reported that "Colorado Springs, Manitou, the Garden of the Gods and Pike's Peak are being thronged with visitors from Europe and the states." Indeed, even U.S. senators came to view the spectacle. The *Chieftain* continued, "Many United States senators, under the lead of Senator [Henry] Teller, are already at the Manitou House,¹ and others are expected." Tents were set up in the Garden of the Gods, from which local spectators could watch the eclipse for a twenty-five-cent fee.

As towns readied to observe the eclipse, competition over which of them along the eclipse path was best situated for observation became fierce, and that competition played out in the press. Colorado's papers were conscious of the fact that the eyes of the world were on them, and each local publication touted its city's relative merits or challenged claims of unsuitability from its rivals. Denver's *Rocky Mountain News* fired the first volley by warning eclipse tourists away from the higher elevations in July because "the rainy season begins in the mountains about that time."

¹ Manitou Springs' first hotel, built in 1872.



But the *Georgetown Courier* of July 25, 1878, quickly defended its mountain community, snapping back:

As the *News* seems to know all about it, will it be kind enough to inform us all about the "rainy season," for we freely confess that we are unable to see any system whatever to the rain storms of the Rocky Mountains . . . we would like to know upon what authority the *News* tells its readers that they had better stay in Denver.

In the end, Georgetown seems to have won bragging rights. A few weeks after the eclipse, a spectacular view of the event as seen from Argentine Pass high above Georgetown graced the front cover of *Harper's Weekly: A Journal of Civilization* (see page 22). It was one of the most memorable and widely distributed depictions of the eclipse, and Denver was undoubtedly envious.

In addition to the attention the eclipse was bringing to Colorado, another reason nearly everyone—not just the scientists—was excited about the event was their ability to participate in the observations. Earlier in the year the U.S. Naval Observatory, which had funded the expeditions that were going to the Rockies to view the eclipse, had published and distributed a thirty-page booklet called *Instructions for Observing the Total Solar Eclipse of July 29, 1878*. The observatory prepared the booklet for those "persons who may witness the total solar eclipse of July 29, and who may desire to co-operate with the United States Naval Observatory, to some of the phenomena which, in the present state of science, it is most desirable should be carefully observed on that occasion."

The booklet included basic instructions for observing the eclipse, such as: the importance of noting the exact time totality began and ended in an observer's particular location; how to most accurately sketch the sun's corona; and how to use a telescope to search for Vulcan. The booklet also provided blank pages in the back with sample templates on which observers could sketch their observations during or immediately after the eclipse. It was a chance for average Coloradans—not just professional scientists—to contribute in some small way to the scientific study of the eclipse instead of just being passive observers. The *Georgetown Courier* got so excited about the opportunity to participate that it had dreams of scientific grandeur, and gushed ecstatically:

When the Navy Department issued their circular asking intelligent observers within the line of the eclipse to note the time of totality, etc., we instantly conceived the idea that *at last we were among the favored mortals of earth*, and here was the chance to strike for fame, and . . . visions of honorary membership to the prominent scientific societies of the world.²

² Italics added for emphasis.

The Denver Tribune of July 30, 1878, gave its readers extensive, splashy coverage of the previous day's eclipse.

THE ECLIPSE

Complete Success In Colorado of the Great Event.

The Astronomers Making a Laudable Effort to Throw Light Upon a Dark Subject.

The Weather Proves Propitious Beyond All Expectations.

Satisfactory Reports from All Sections of the Country.

Telegraphic Dispatches from Central, Pueblo, Pike's Peak, Rawlins, Creston, Greeley, Carson, Boulder, Longmont, La Junta, New Orleans, St. Louis, and Other Points Too Numerous To Mention.

All Denver Turns Out to See and Enjoy the Free Show.

Reports from Professors Young, Colbert, Burnham, Penrose, Renyard and Mitchell.

Chiefly Negative, But Confirmatory and Important Results,

With An Inkling of the Discovery of a New Planet and the Observation of a Seldom-Seen Star.

A Crown of Glory in the Heavens.

Observing the Eclipse from Above 14,000 Feet



Samuel P. Langley

While the rest of Colorado was worried about bad weather during the week before the eclipse, high atop the 14,115-foot summit of Pikes Peak expedition leader Samuel Pierpont Langley and his team were experiencing it firsthand.

A little more than a week before the eclipse, Langley and his team scaled Pikes Peak and set up their observatory, consisting of a large telescope on loan from the U.S. Naval Observatory and a few other instruments, all of which reportedly took a team of twelve mules five trips to bring to the summit. Though the weather above 14,000 feet is always extreme, it was the middle of July; so if there was ever a chance for mild weather, it was then.

Yet the conditions in the days prior to the eclipse were particularly nasty.

Langley wrote of horrendous winds that battered his tent and “roared with a noise like that of a loose sail in a gale at sea.” One morning, just a few days before the eclipse, he woke to find a ten-inch drift of snow lying next to him on his pillow. This was *inside* his tent.

A perfect example of the unreliable weather common on Pikes Peak is found in Langley’s description of his efforts on July 24 to set up the telescope (known as an “equatorial” telescope for the way in which it is mounted):



From atop Pikes Peak, Langley's contingent of eclipse observers marveled at the phenomenon of their own shadows on the clouds before them.

The day was passed in fruitless attempts to adjust the equatorial. In the morning the canvas which covered it was frozen and loaded with hail. A little later the sun shone out suddenly and with surprising warmth, turning the hail to water. I commenced unwrapping the canvas, and was lifting it off, when the sun disappeared as suddenly as it came out, and, before I could put the cover on again, it was hailing once more, and we were involved in dense cloud. The cloud was continuous, except for several brief moments of sunshine, during which I uncovered the instrument several times to no purpose.

Thus, for the party of astronomers camped atop Pikes Peak, the weather during the week leading up to the eclipse (to say nothing of the lack of oxygen) did not inspire confidence. "Hail, rain, sleet, snow, fog, and every form of bad weather continued for a week on the summit," recalled Langley. But on July 29, the day of the eclipse, the morning dawned clear and cloudless to the tremendous relief of everyone both on Pikes Peak and across Colorado.

It would be a great day for an eclipse.

The Naval Observatory encouraged everyone to send their drawings back to the capital for analysis. These submissions (done variously in pen, pencil, chalk, and oil) are still housed in archives in Washington, D.C.

With so many eminent scientists coming to Colorado for the eclipse, to say nothing of all the tourists, Colorado's pride was on the line. Imagine if, after all the effort and expectation, cloudy skies or a rainstorm prevented the eclipse from being observed—bad weather would spell disaster. One can understand the anxiety, and therefore the reasoning behind an article that ran in the *Denver Tribune* on July 14, 1878—just two weeks and a day before the eclipse. Titled simply “The Eclipse and the Weather,” the article reviewed weather records for the date of July 29 during the preceding six years to determine the odds of having good weather (“upon which everything depends”) for the day of the eclipse. “There are so many scientific parties coming to Colorado to observe the approaching eclipse that great interest is felt in the condition of the weather,” wrote the *Tribune*. The article proceeded to give an account of the “state of the weather at 2:43 P.M. [the approximate time of the 1878 eclipse] of July 29, for each year since 1872.”

The report was optimistic: The preceding six years produced four clear July 29ths, and only two cloudy ones. The odds were good. In the week leading up to the eclipse, however, the weather of years past appeared to be of no help. Rain fell intermittently across the state, and summer thunderstorms obscured the afternoon skies.

But on the day of the eclipse luck was indeed on Colorado's side: The morning dawned bright and clear, and the skies remained cloudless into the afternoon.

The relief felt by many in Colorado might best be summed up by the report that came in from Walter Spencer, the *Denver Times* reporter stationed in Castle Rock: “Weather splendid for eclipse—clear as hell.” The *Georgetown Courier* later reported: “Monday morning the sun rose . . . in a cloudless sky, and every sign bespoke a genuine Colorado summer day for the great event astronomers had promised.” Yet another *Georgetown* headline gushed, “The Eclipse! A Glorious Day for Colorado! Our State Doesn't ‘Go Back’ on Herself.”

The day after the eclipse the *Denver Tribune* was perhaps the most effusive:

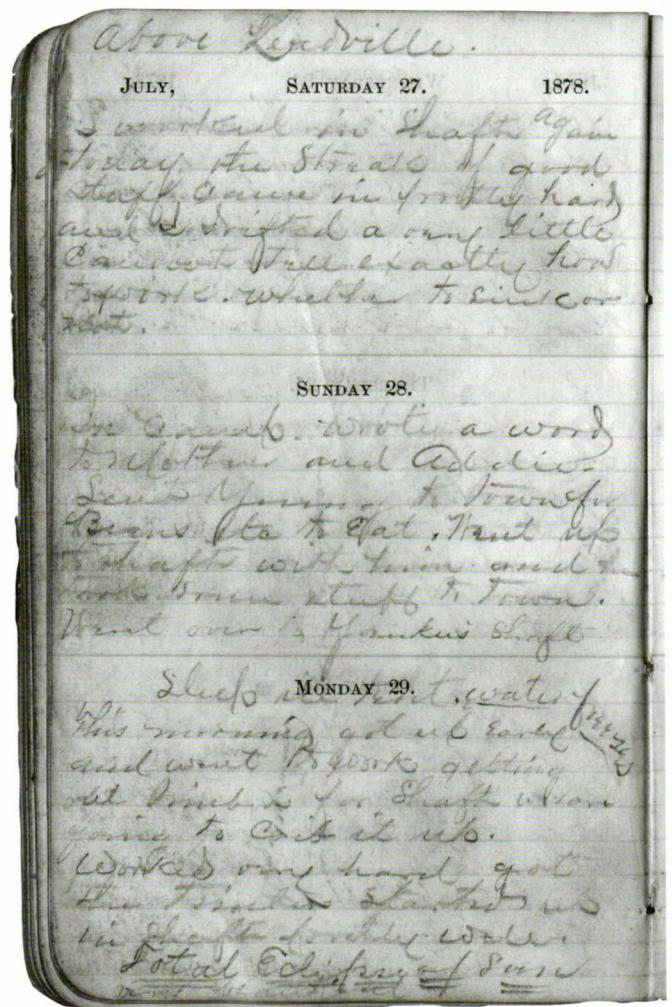
In the presence of so many bright and shining lights of science . . . THE TRIBUNE cannot let the occasion pass by without complimenting Colorado on the beautiful weather she furnished for the occasion, and the general success which attended the exhibition. It was a notable event in our history. Previous bad weather had led [us] to fear that yesterday might be cloudy, [but] Coloradans . . . felt sure that Colorado would prove equal to the emergency and show the world that she knows how to entertain an eclipse party in good style and furnish them every opportunity for observation and scientific deduction.

With such fantastic weather the scientists, local residents, and tourists awaiting the big day all got an early start to their chosen observing sites. Although the eclipse would not begin until around 2:15 in the afternoon (the exact time varied according to one's location), there was no time to waste. The *Georgetown Courier* would later report: “Many parties left town in the morning for the mountains; Grays Peak, Argentine Pass, Sherman, Grif-fith and Leavenworth mountains, receiving full delegations.”

In Colorado Springs, according to the *Colorado Chieftain*, “Seats upon the balconies of our best houses are all engaged, and elevated platforms are being erected upon our public square. The windows in our church steeples have been leased—those facing the eclipse at fifty cents and those facing in the opposite direction at half price.” And if press reports are even partially true, it seems that absolutely everyone who was able stopped whatever they were doing and went outside out to see the eclipse. In Denver, banks shut down, stores closed, and the streets filled with awestruck observers staring upwards. Lake City's *Silver World* wrote, “it is not too much to say that every man, woman and child in town had a piece of smoked glass or something of that nature, through which the eclipse was taken in.”

Many observers recorded the event in their diaries. British immigrant Frances Georgina Miller's diary entry for July 29, 1878, noted that she and her husband, George, returned home after an outing to visit friends in time to see the eclipse: “G[eorge] & I rode over to Mr. & Mrs. McBride res[idence] . . . extremely hot. A splendid view of the Eclipse when we got home.”

John L. Emerson was a miner excavating a promising



In his brief diary entries for late July 1878, miner John Emerson gives his location (at the top of the page) as "above Leadville" and, at the bottom of the page, registers his excitement at viewing a total eclipse of the sun.

lode he had just discovered a few weeks earlier, above Leadville. Emerson was a regular diarist, though most of his entries were short and prosaic—just a few sentences each day—and merely conveyed the routine life of a miner: "I worked on our lode"; "anxious to get into good mineral"; "at work hard again today." But in his entry for Monday, July 29, 1878, the monotony was—at least temporarily—broken: "Sleep in tent. Water freezes. This morning got up early and went to work getting out timber for shaft, we are going to crib it up. Worked very hard, got the timber started up in shaft. Total Eclipse of Sun." Emerson was so impressed with the eclipse that not only did he pause his mining activities long enough to pop his head out of the ground to watch it, but he recorded the event with double underlining for emphasis, an emotional outburst not readily found elsewhere in his diary. The

eclipse was a memorable event for a lone miner watching from his high-altitude claim.

In the days following the eclipse, towns and their newspapers vied for first place in the competition of who got the best view of the eclipse, who had the best turnout, whose scientists got the best results, and who generally did the eclipse *better* than the others. And no claim to victory went unchallenged. When a Denver paper ran the seemingly innocuous headline "Denver Eclipse," Georgetown's *Colorado Miner* nearly flipped:

Rather cheeky use of the word Denver as an adjective in this connection! Had it read "Denver Eclipsed," it would have come nearer the truth, for the view from Argentine [Pass] and Gray's Peak was far superior to that vouchsafed our friends in the capital.

At Pueblo.

[Special dispatch to The Tribune.]

PUEBLO, July 29.—The weather was highly favorable for observation of the eclipse, which commenced at 2:17 p. m., with a peculiar Indian summer like appearance of the atmosphere at 2:35. The sun was half obscured at 3:02 and at 3:21 chickens and pigeons commenced to go to roost. At 3:26 the eclipse was complete and the sun was obscured completely for three minutes. The appearance of the corona was magnificent, the sun resembling a huge Catherine wheel in full of combustion. At 3:29 the eclipse began to disappear, and in two hours and eight minutes from the time of the first observation it disappeared entirely. Advice from scientific parties stationed at La Junta and West Las Animas, announce there a complete success. Vulcan was not observed.

At Colorado Springs.

[Special dispatch to The Tribune.]

COLORADO SPRINGS, July 29.—The observations of the eclipse to-day, made from the summit of Pike's Peak, were entirely successful. The atmosphere was beautifully transparent, not a single cloud interfering with the observations. The corona was followed for six minutes after totality by General Myer. The same was followed by Professor S. P. Langley some twelve diameters of the sun one side and three on the other. Measures of the extent of the inner corona were made by P. L. Crosby, of the War Department, and of the brightness of the same by Professor J. W. Langley. The corona was elongated and resembled the zodiacal light. Perfect satisfaction with the observations is expressed by the entire party.

Schuyler.

[Special to The Denver Tribune.]

GREELEY, July 29.—Greeley was just outside the line of totality.

Greeley.

(Special to The Denver Tribune.)

UNITED STATES ECLIPSE STATION, SCHUYLER, COLO., July 29.—The day opened without a cloud and continued clear through all observations. All four contacts were observed by different members of the party, as also was the structure of the corona at the time of totality. Lengths of cords were observed by Professor Stone and transits of cusps by Mr. Upton. The observations as a whole were very successful.

Carson

[Special Dispatch to The Tribune.]

KIT CARSON, July 29.—First appearance of eclipse, 3:13; totality, 4:26.12 to 4:26.15 or three seconds; end of eclipse, 5:29, Jefferson city time.

Boulder.

[Special Dispatch to the Tribune.]

BOULDER, July 29.—The day has been fine and the eclipse a great success. All pronounce it the grandest and most glorious vision ever seen on earth.

Longmont.

[Special Dispatch to the Tribune.]

LONGMONT, July 29.—The eclipse was a grand success, only two small clouds passed over the face of the sun, but they did not remain long enough to interfere with the view. Every man, woman and child had a glass. Some of the business houses closed so as not to be annoyed with customers. The total eclipse continued from 3:25¼ to 3:28¼. The chickens performed some lively crowing and started for their roosts. When the face of the sun was covered it was as grand a sight as man could wish to see.

The day after the eclipse, the Denver Tribune chronicled observations filed by its Front Range eclipse spotters.

Within a few days of the eclipse at least three major papers (Georgetown's *Colorado Miner*, Denver's *Tribune*, and Colorado Springs' *Gazette*) published "eclipse editions," wherein much of the paper was devoted to reporting on the event.

The *Tribune* bragged that it sold 6,000 copies of its paper on July 30, the day after the eclipse: "The demand . . . was almost if not quite unprecedented in the history of Colorado journalism." And the next day, July 31, demand continued: "Another large 'eclipse edition' was printed . . . in response to telegraphic orders from different

parts of the country, swelling the total number of papers distributed to nearly *ten thousand copies* . . . almost every citizen preserved one for future reference."

Even the *Chieftain* bolstered its own municipal pride by admitting that while Pueblo may not have played host to any major eclipse expeditions (perhaps due to its location slightly outside the eclipse path), it nevertheless felt that its citizens had contributed to the slew of scientific observations:

Pueblo was not honored with the presence of any foreign *savants*, but home talent made up in enthusiasm what

it lacked in scientific skill, and we'll venture to say that Elijah Blodge, Esq., of this city, has as much certain information as to the formation of the corona or the existence of "Vulcan," as any of the "high larnt" roosters who squinted through a big telescope on Monday afternoon.

Newspapers boasted about the results scientists obtained while working in their vicinity. A few reports announced that astronomers working around Colorado had discovered Vulcan, but their results were preliminary and had to be reviewed (and, of course, we now know no such planet to exist). Perhaps more interesting was the discovery of giant "streamers," or solar rays, extending out from the sun's corona. These streamers spread outward from the sun to a massive extent—they appeared to extend up to twelve times the sun's diameter, or more than ten million miles. It was an extraordinary discovery. Indeed, a common result of many observations of the 1878 solar eclipse was the size of these coronal streamers when compared to observations of past solar eclipses. The streamers were most accurately captured by Samuel P. Langley from the summit of Pikes Peak, where the atmosphere was crystal clear.

The *Colorado Springs Gazette* could have won top prize for scientific reporting on the eclipse, as it was able to procure a report on the giant streamers from Cleveland Abbe. Having joined Langley atop Pikes Peak, Abbe got altitude sickness the day before the eclipse and was rushed down to an elevation of about 10,000 feet. But even from that lower altitude he observed and drew the streamers similar to Langley's observation (although Abbe was clearly not the draftsman Langley was).

Whereas most astronomers believed the streamers to be vast extensions of the solar atmosphere, Abbe had a different theory. He proposed that the giant rays were not part of the sun at all. Instead, the streamers "had nothing to do with the observer, or [Earth's] atmosphere, or moon, no, not even with the sun" but were in fact "grand streams of meteors . . . rushing along in parallel orbits about the sun." It was a novel theory, and the *Gazette* (which ran Abbe's story exclusively) bragged that Abbe's "observations will probably result in the overthrow of all previously entertained theories respecting the character and cause of these streams of light." Yes, the *Gazette* all but printed in bold type, *you read it here first!*

The eclipse of 1878 was Colorado's scientific coming-out party, marking the state's beginning as a favored location for scientific research. Twenty years later Nikola Tesla would come to Colorado Springs to conduct electrical experiments in Colorado's high, dry air. In the short term, Colorado became a leader in astronomy in the American West. As a direct result of the 1878 eclipse expeditions, the Colorado College (founded in 1874) was the recipient of one of its first scientific instruments: a four-foot telescope brought in from Brooklyn to observe the eclipse, and afterward given to the college when donors purchased it from the astronomers who had brought it to Colorado.

In 1888, just ten years after the eclipse, Humphrey B. Chamberlin pledged a

THE GREAT SOLAR ECLIPSE			
Monday last, the 29th of July, was one of God's own days, a perfect Colorado day, perfect in every thing that could make the observations of this greatest of Nature's events of the century successful. Golden has the School of Mines, with all the appliances and a most charming site for making the observations for which scientific parties from all the leading institutions of America, as well as many from foreign shores, have come to Colorado. It is to be regretted that the professor in charge did not realize the importance of utilizing the appliances of the institution on this occasion, not even to the tendering them to others, but by the courtesy of Professors Luce and Grenier we are enabled to give the result of their observations:			
GOLDEN ECLIPSE PARTY.			
Professors Joseph Luce and Ernest Grenier formed a party of observation and stationed with their Telescope and Theodolite on the corner of Washington avenue and Fourth st., opposite the residence of our next governor. The apparatus had been kindly placed at their disposal by Capt. E. L. Berthoud, chief engineer C. U. R. R., now in charge of the surveying of the line of the National Pacific railroad in Montana. The observations were watched with interest by a large number of fair ladies and several gentlemen.			
The following is the record of the variation of the temperature during the day:			
4 a. m.	64.19		Clear.
5 "	61.50		"
6 "	63		"
7 "	64		"
8 "	72		"
9 "	75		"
10 "	80		"
11 "	82		"
12 m.	84		"
1 p. m.	85	Small clouds w. and n.	
2 "	86	" " " " passing in front of the sun.	
3:10 "	86	Small clouds nw. and e.	
3:30 "	86	" " " "	
4:45 "	86	" " " "	
5:30 "	85	" " " "	
6:15 "	84	" " " "	
7:30 "	82	Clouds vanishing.	
8:45 "	80	" " " "	
9 "	78		Clear.
10 "	85		"
11 "	86		"
12 m.	87		"
1 "	87		"
The following is a tabular statement of the different phases of the eclipse:			
First contact	2 hours, 20 min.	5 sec.	
Second "	3 "	28 "	30 "
Third "	4 "	31 "	25 "
Fourth "	4 "	54 "	
Duration of eclipse	2 "	14 "	
Totally	2 "	55 sec.	

The *Colorado Transcript's* coverage of the eclipse included a detailed record of temperature variations and observations of cloud patterns for the duration of the event.

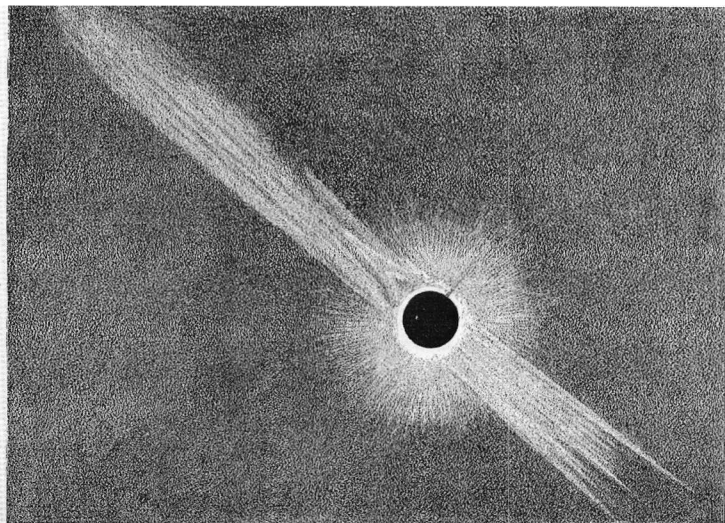
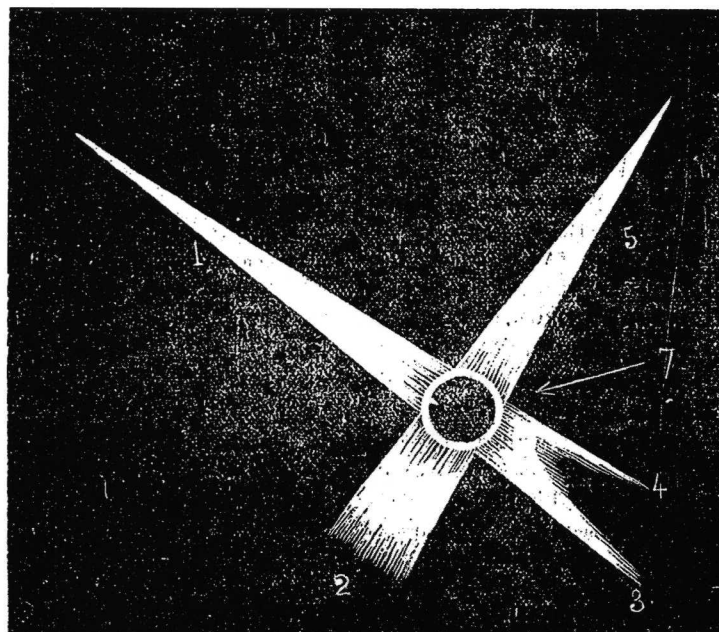


FIG. 40.—OUTER CORONA OF 1878. (U. S. NAVAL OBSERVATORY.)



Above: Langley made this artistic rendering of the eclipse at totality.

Right: In a single illustration (printed in the August 10 Colorado Springs Gazette) Abbe did his best to convey the changing appearance of the sun's rays during the eclipse. Number one, for instance, "was seen on my first glance at the corona," and was visible simultaneously with rays two and three. "About thirty seconds before the end of totality," he later adds, "I saw a reddish mound increasing at the base of number five, and the sun finally burst forth at a point marked number seven between rays four and five."

whopping \$50,000 to build and equip an observatory for the University of Denver. The Chamberlin Observatory housed a massive nineteen-foot-high telescope that was for a time one of the largest in the world. Other, smaller observatories would follow, and now Colorado has a number of active amateur astronomical organizations and societies. And to this day efforts continue by the National Space Science & Technology Institute to build a large infrared observatory on the summit of Pikes Peak.

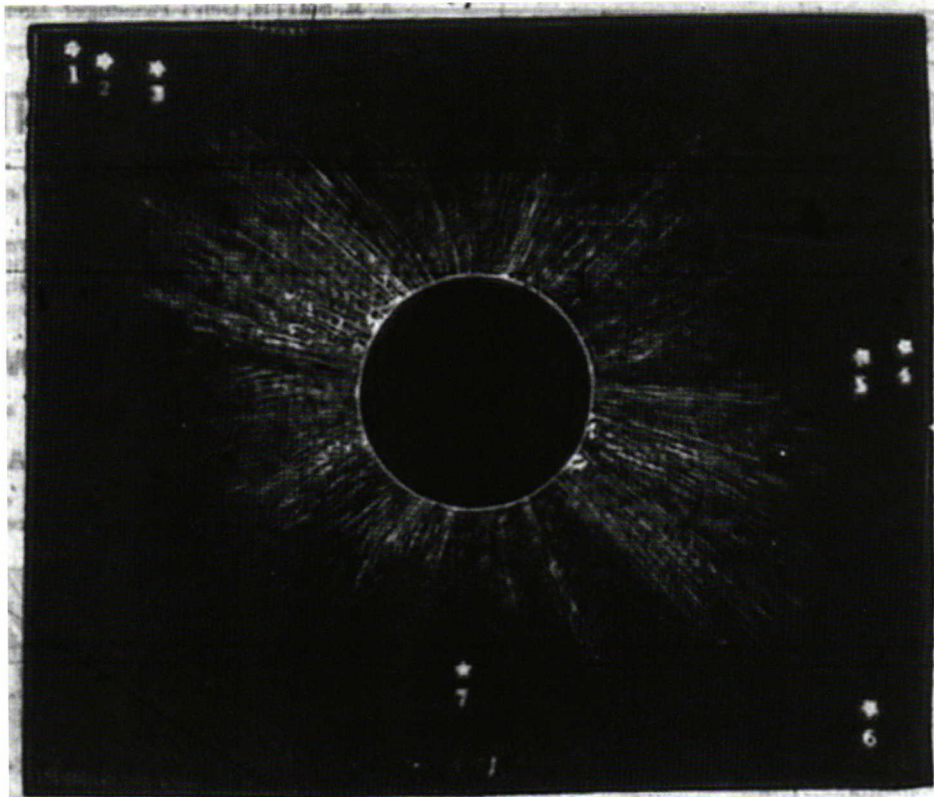
Most importantly for Colorado, however, was what the "great eclipse" of 1878 did for the young state's pride. The eclipse put Colorado on the map scientifically and, to a significant degree, culturally as well. Never before had so many people from all walks of life—simple tourists to the world's great scientists—descended upon Colorado for one major event. And with so much uncertainty about the weather until the very last moment, the anxiety and potential for major disappointment was high. But Colorado's weather held true—much to the citizens' pride—and the eclipse went off without a hitch. It was an event that was celebrated across the state, across the country, and across the globe.

For a few brief moments in its young history, even though the sky was dark overhead, Colorado was grandly illuminated in the eyes of the rest of the world.

For Further Reading

Among secondary sources the best general account of the 1878 eclipse is John A. Eddy, "The Great Eclipse of 1878," *Sky and Telescope* (June 1973), 340–46. Eddy focuses primarily on the Creston, Wyoming, expedition and the search he and his family undertook to find the exact observation site in Separation, near Creston. But his account provides a good summary of the scientific significance of the eclipse. On the tremendous interest in the search for planet Vulcan see Richard Baum and William Sheehan, *In Search of Planet Vulcan: The Ghost in Newton's Clockwork Universe* (New York: Plenum Trade, 1997); specifically see chapter 14, "The Planet Hunters Come to Indian Country," 194–208. For the role of the U.S. Naval Observatory in funding and organizing the 1878 eclipse expeditions see Steven J. Dick, *Sky and Ocean Joined: The U.S. Naval Observatory 1830–2000*, (UK: Cambridge University Press, 2003), 202–205. On nineteenth-century eclipse expeditions in general, Alex Pang's *Empire and the Sun: Victorian Solar Eclipse Expeditions* (Stanford, CA: Stanford University Press, 2002) explores interesting interactions between astronomy and culture, and between professional and amateur eclipse observers.

Among primary sources, readers may be interested in



Total Phase of the Solar Eclipse as Seen from Denver.

A woodcut in the July 30 Denver Tribune depicts, "as accurately as a wooden block may be made to do," the eclipse in relation to the celestial bodies visible around it: 1) the planet Mercury; 2) the star Regulus; 3) the planet Mars; 4) the star "Custer" (Castor); 5) the star "Pollox" (Pollux); 6) the planet Venus; and 7) the star Procyon.

Two and a half weeks after the eclipse, the August 17 Denver Tribune reprinted an item from the Transcript of Golden in which Edward L. Berthoud made a curious observation about the behavior of grasshoppers during the event.

—Captain Berthoud, having returned to Golden, furnishes the Transcript with an account of his observations of the eclipse at Red Cañon. He makes a note of the fact that "a cloud of grasshoppers was visible around the sun previous to the eclipse; upon the occurrence of totality they all fell to the ground."

reviewing the U.S. Naval Observatory's official account of the 1878 eclipse expeditions: *Reports on the Total Solar Eclipses of July 29, 1878, and January 11, 1880* (Washington: Government Printing Office, 1880), available in the archives of the Colorado Historical Society's Stephen H. Hart Library. Also of interest is the U.S. Naval Observatory's thirty-page guide to observing the eclipse, *Instructions for Observing the Total Solar Eclipse of July 29, 1878, Issued by the U.S. Naval Observatory* (Washington: Government Printing Office, 1878). Finally, Samuel Pierpont Langley discusses his eclipse travails high atop Pikes Peak in his book *The New Astronomy* (Boston, 1888).

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