

EXCERPTS FROM SIMON NEWCOMB'S DIARY OF 1860

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ABSTRACT

In 1860 Simon Newcomb journeyed from Boston to Manitoba to observe a total solar eclipse. A microfilm copy of Newcomb's Diary for the trip, along with a typescript, is held by the University of Saskatchewan Archives. Wherever entries appeared of relevance to astronomy or contained supplementary information about the trip to view the eclipse, they have been included here as excerpts. The scientific data on the Sun, which Newcomb and his party planned to obtain at totality, were summarized in a newspaper account by a reporter who accompanied them on a segment of their travels. Newcomb endured extreme hardships during his hazardous journey and clouds prevented him from viewing to his satisfaction the totally eclipsed Sun.

RÉSUMÉ

En 1860, Simon Newcomb a voyagé de Boston jusqu'au Manitoba afin d'observer une éclipse totale de soleil. On retrouve une copie du journal de voyage de Newcomb sur microfiche ainsi qu'une transcription sur papier, dans les archives de l'Université de Saskatchewan. Les extraits qui suivent ont été choisis parce qu'ils contiennent des commentaires pertinents sur le voyage. Les données scientifiques que Newcomb et ses collègues espéraient obtenir durant la totalité étaient décrites dans un journal par un reporter qui les accompagna durant une partie du trajet. Newcomb a dû endurer de grandes épreuves durant un voyage très difficile et les nuages l'empêchèrent d'observer l'éclipse à son gré.

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1. INTRODUCTION

The 19th century was a period of rapid progress in astronomy, of transition from the well established methods for determining accurately the positions of objects on the celestial sphere to a new, definitely more exciting, means of unraveling the unknowns associated with the physical constitution and internal operation of the stars. The concept of a dragon swallowing the Sun at the time of a solar eclipse was no longer in vogue and the early 19th century view of the elder Herschel, that the Sun was a cool, dark, habitable globe, was likewise to be altered. Significant advances were made possible by the application of direct photography to the Moon, the Sun and the stars. A second area of study was opened through the use of spectrum analysis in the examination of either the direct or reflected light coming from such bodies, again recorded on plate or on film. There was still much to be learned about the prominences of the Sun and the

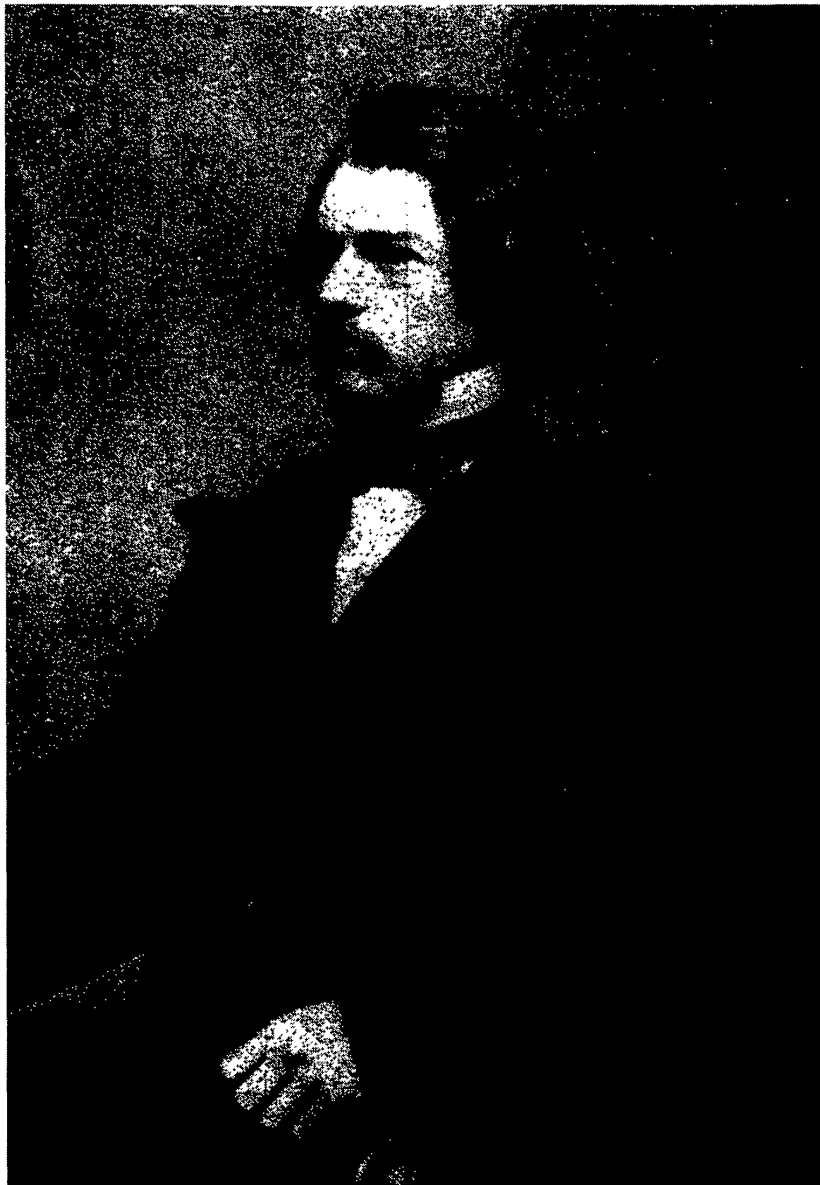


FIG. 1—Simon Newcomb (1835–1909). This photograph of the great American astronomer, who was born in Canada, was probably taken between 1875 and 1880.

structure of the solar corona, two features clearly visible during those few precious moments of a total eclipse when the Moon occulted the bright solar disk.

The observations to be undertaken by an eclipse party are related directly to the resources available during the limited time of totality. The instruments Newcomb transported to Manitoba were a telescope, a sextant, a chronometer, a polariscope and a spy glass. Reverend Edward Eggleston, a reporter for the *Daily Minnesotian* newspaper who accompanied the eclipse party from St. Paul to Fort Garry, outlined the “several objects” which the astronomers were seeking in their

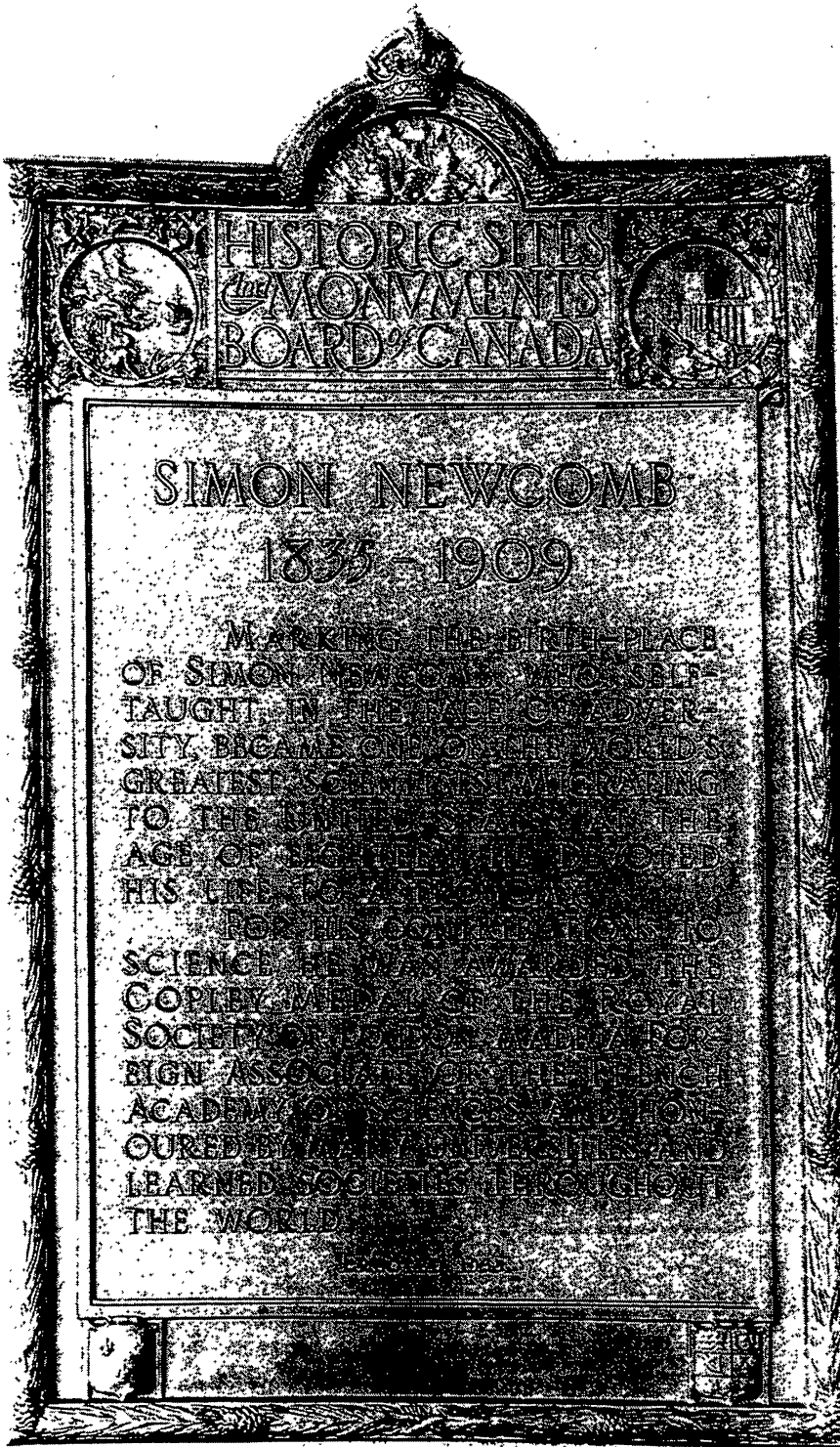


FIG. 2—The achievements of Simon Newcomb, as well as his honours, are outlined concisely in the wording on the plaque of the stone monument erected at Wallace Bridge, Nova Scotia. He was an outstanding 19th century astronomer and scientist. (Photo credit: Provincial Archives of Nova Scotia)

observations at totality: "to determine ... the origin etc. of the protuberances ... to investigate the subject of the polarization of light ... to seek for inter-mercurial planets."

The eclipse party of 1860 was comprised of three scientists: Simon Newcomb (figure 1), William Ferrel and S.H. Scudder. Newcomb and Ferrel were both astronomers and junior members of the staff of the Boston Nautical Almanac Office. Scudder was a naturalist at the Museum of Comparative Zoology in Cambridge, Massachusetts.

Simon Newcomb's distinguished career in astronomy (figure 2) has been described previously to readers of the *RASC Journal*. He moved from Boston to Washington in 1861 to become Professor of Mathematics with the U.S. Navy and to carry out astronomical observations at the Naval Observatory. In 1877 he was appointed Superintendent of the American Ephemeris and Nautical Almanac Office in Washington. His research dealing with the theory of the motion of the Moon was one of his superior achievements.

Ferrel, a mathematician and meteorologist, published research papers covering such topics as tides, atmospheric motions, storms and cyclones. His later contributions to the scientific literature on astronomy were rather minor.

As was common on 19th century scientific expeditions, Scudder was included to observe nature and collect specimens. Eggleston described him as an enthusiast, "impaling every curious insect that he meets." Some twenty-five years after the 1860 eclipse journey, Scudder recorded his experiences in *The Winnipeg Country or Roughing it with an Eclipse Party* (Boston: Cupples, Upham, 1886). This published account gives little coverage or credit to the other two scientists.

2. DIARY EXCERPTS

Friday, May 11th, 1860. Word came this morning that I should go to Lake Winnipeg to observe the total eclipse of July next (figure 3). Went to the observatory and talked with Bond, & examined the Sun through telescope.

Tuesday, May 15th, 1860. Spoke to Bond for a chronometer. [G.P. Bond was Director of Harvard Observatory from 1859 to 1865. He was the founder of photographic astronomy and shared in the discovery of Hyperion, one of Saturn's satellites.]

Friday, May 18th, 1860. Went to the observatory with Germyn to get the telescope, but did not succeed.

Tuesday, May 22d, 1860. Borrowed a polariscope from Prof. Lovering to observe the eclipse. [Joseph Lovering was an astronomer and mathematician;

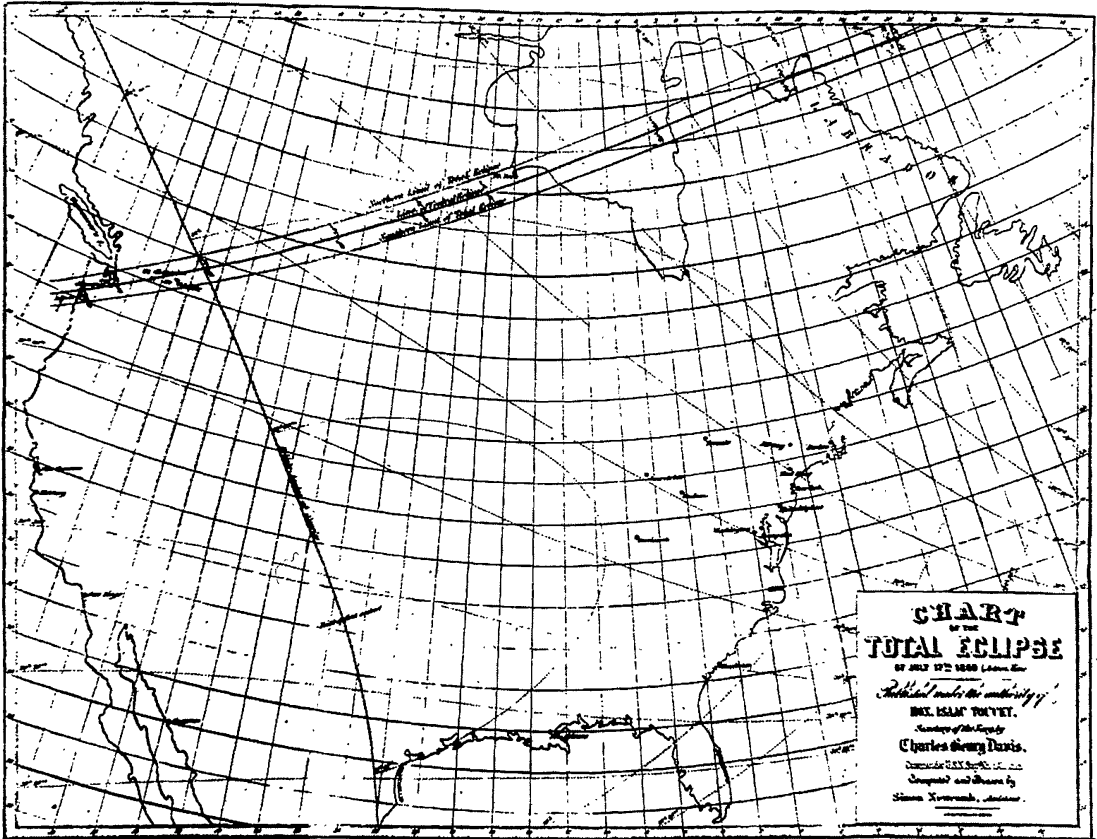


FIG. 3—The narrow path of totality across Canada for the solar eclipse of July 17, 1860, was computed and drawn by Simon Newcomb as an assistant in the Nautical Almanac Office, at that time located in Boston, Massachusetts. The heroic struggle to reach the eclipse path is recorded in Newcomb's Diary. [The date given in the Diary is July 18, 1860]

from 1838 to 1888 he was the Hollis professor of mathematics and natural philosophy at Harvard. Taking a polariscope on the expedition indicated that Newcomb realized the significance of the corona in the observation of a total solar eclipse. At totality, the white light of the coronal ring, which appears to surround the hidden solar disk, becomes visible. For more than half a century following 1842, astronomers wrestled with the question of whether or not the corona was polarized.]

Wednesday, May 23d, 1860. Received the telescope from the observatory this morning. Foote and Ferrel looked through it in the evening.

Friday, June 1st, 1860. Left Boston in the 9 a.m. train. Before I started I opened a letter from Ingraham, declining to forward the money for our astron[omical] expedition.

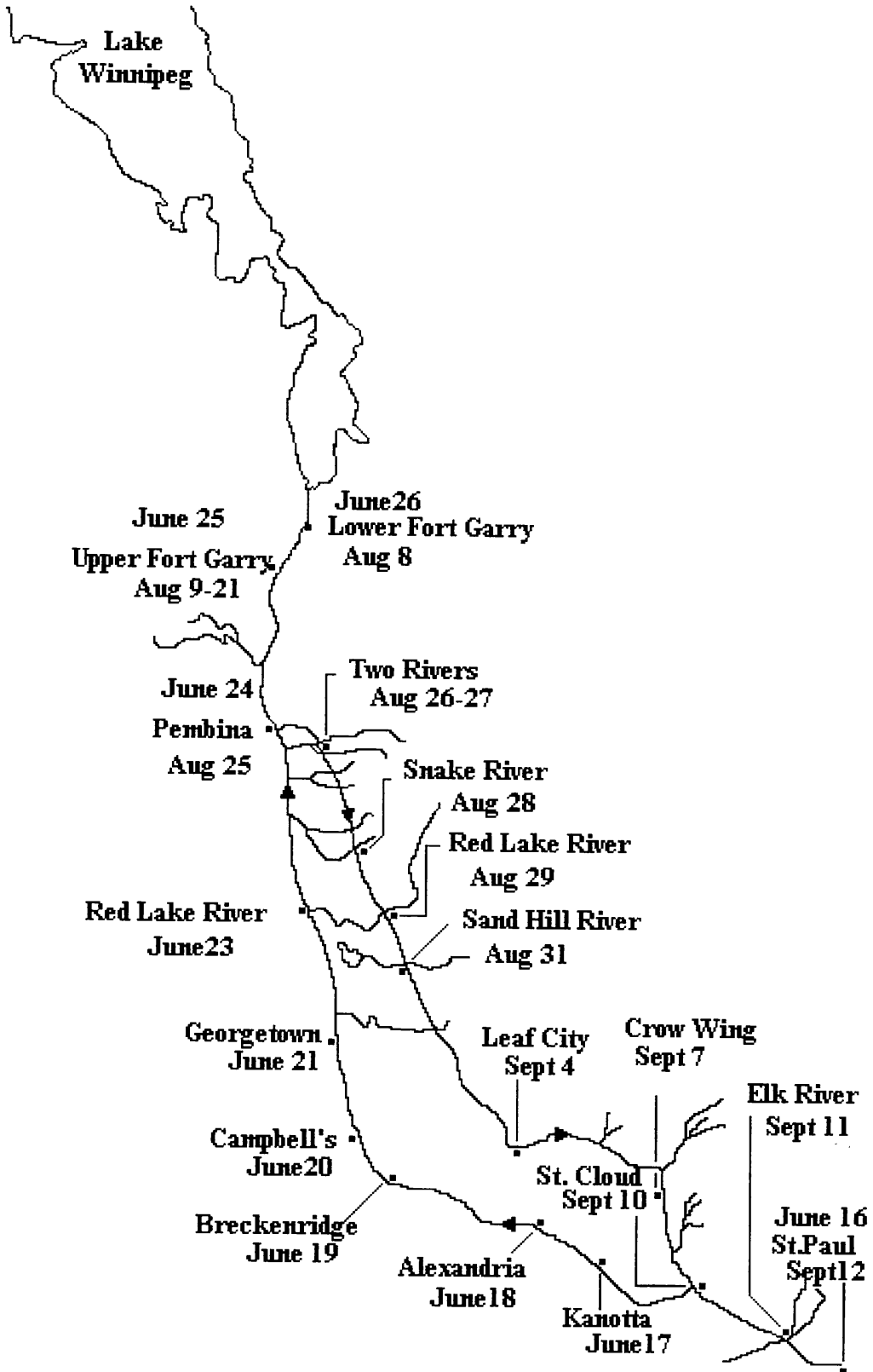


FIG. 4—Map of the expedition route from St. Paul, Minnesota, to Fort Garry, Manitoba, and return.

Saturday, June 9th, 1860. Arrived at Chicago at 6½ a.m. Went to telegraph office and found three dispatches from Capt. Davis informing me that the money for the expedition had been raised, and directing me to proceed to Fort Garry. [Charles Henry Davis, Commander U.S.N., was Superintendent of the Nautical Almanac Office in Cambridge, Massachusetts, and responsible for the selection of Newcomb and Ferrel as scientists with the 1860 eclipse party.]

Sunday, June 10th, 1860. Arrived at St. Paul at 7 p.m., and found two men from Fort Garry at the Winslow House.

Monday, June 11th, 1860. Talked with Mr. Inkster of Ft. Garry ... was informed by him that canoes were sometimes delayed on the lake whole days by storms.

Thursday, June 14th, 1860. Mr. Ferrel arrived this morning in comp[any] with Mr. S. H. Scudder.

Friday, June 15th, 1860. We made arrangements with Mr. Burbank to be taken to Georgetown (figure 4) ...

Saturday, June 16th, 1860. Left in stage at 5 a.m.

Thursday, June 21st, 1860. Started with new team, and arrived at Georgetown before 7. Found surveyor Atwater.

Saturday, June 23d, 1860. Boat started at 4 a.m., expecting to reach Fort Garry on Monday afternoon. Arrived at Red Lake River at 10 p.m.

Sunday, June 24th, 1860. Arrived at Pembina about 7 o'clock p.m. A comet visible this evening.

Monday, June 25th, 1860. Arrived at Fort Garry at 10½ o'clock a.m. Found Gov[ernor] Mactavish, who said that we should have to get our boat &c. at the "lower Fort," 22 miles down. Opened our instruments, and took out sextant & spy glass. [Sir George Simpson, Governor of the Hudson's Bay Company, had instructed William Mactavish, Governor of Assiniboia and officer-in-charge of Upper Fort Garry, to provide whatever assistance the eclipse party required in carrying out their scientific pursuits. Mactavish arranged for their transportation, albeit in a leaky canoe, as well as provisions, a guide and paddlers for the two crossings of Lake Winnipeg. On their return to Fort Garry, Mactavish then arranged for the party's return by wagon-train over the plains to St. Paul.]

Tuesday, June 26th, 1860. Found index error of sextant to be -30". Gov[ernor]

Mactavish came to the hotel this morning, and gave us letters to Mr. Lilly in charge of lower fort. Left for lower fort at 3½ p.m. in Mackinan barge, and arrived at sunset. Mr. Lilly got George Kipplin[g], for guide this evening.

Wednesday, June 27th, 1860. Sent Kippling out in the morning to offer £3 10s each for canoe-men. In the afternoon, he returned stating that the middlemen wanted £4 10s each, and the bowman £5 10s. We shall probably have to engage four middlemen & a bow[ma]n at these rates.

Thursday, June 28th, 1860. Spent the forenoon in getting our provisions and equipment for the trip. Cost, including wages, [£]260. Started for Cumberland House at 3½ p.m. in Sir George Simpson's North canoe. Encamped at sunset, near the house of Peguis, Indian chief after whom we named our camp. Canoe still leaking. Comet fainter.

Friday June 29th, 1860. Started soon after sunrise. Had to stop every ½ hour and bale out canoe. Arrived at Lake Winnipeg at 8¾ a.m. A meteor in the evening in N.N.W. left a tail behind it which lasted 45 minutes, and moved 15° toward west.

Saturday, June 30th, 1860. Started at 7½ p.m., arriving on the North side of Willow Island at 11¾. A bright aurora between 11 & 12.

Sunday, July 1st, 1860. In the afternoon wind lulled, and we left at 3¼ p.m., arriving at Sandy Beach at 11½. A bright aurora from 10½ to 11½.

Monday, July 9th, 1860. Opened instruments this morning, and observed altitudes of Sun. Found chronometer to be fast of local time by 1^h 48^m 13^s, and Lat[itude] to be 52° 4' 9" ±3". Tried to observe Polaris, but could not, owing to the badness of the mercury.

Tuesday, July 10th, 1860. Observed Polaris & α Cygni, making Lat[itude] = 52° 34' 21", & chronom[eter] fast by 1^h 50^m 49^s.

Wednesday, July 11th, 1860. Started at sunrise. Took several Lun[ar] dist[ances] from Sun, making chronometer slow of Greenwich by 4^h 40^m 36^s ±1^s.0. Found index error of sextant to be 43".

Thursday, July 12th, 1860. Off at sunrise. Rounded Cape Kitchinashi at 10½ a.m. At 11 took 12 Lunar distances from Sun, making chron[ometer] slow by 4^h 41^m 10^s ±4^s.

Saturday, July 14th, 1860. We made the portage of the rapids before breakfast. Rose at 2 a.m. to observe occultation of the Pleiades, but was too late. Then tried

to take a Lunar, but was prevented by the almost instantaneous clouding of the whole heavens.

Monday, July 16th, 1860. Took an unreliable Lunar distance from α Arietis in the morning. Heavy wind, so that we did not get off till after breakfast. Dined near the exit of the Saskatchewan from Muddy Lake. Men paddled all night, reaching the round Bend after sunrise.

Tuesday, July 17th, 1860. Men still paddling, but rather sleepy, they make very slow progress owing to the swiftness of the current. In the afternoon clouds and rain, and every appearance of a cloudy morning for the eclipse.

Wednesday, July 18th, 1860. Eclipse morning. Cloudy till eclipse was $\frac{1}{4}$ way through. End of totality at $8^{\text{h}} 15^{\text{m}} 0^{\text{s}}$ per chronom[eter] of eclipse at $9^{\text{h}} 15^{\text{m}} 23^{\text{s}}.2$. Emersion of elongated spot at $9^{\text{h}} 1^{\text{m}} 34^{\text{s}}$. Darkness not so great as I had expected. Cirrus clouds luminous in the N.E. during totality. Took \odot observations for time and Latitude with difficulty owing to the unsteadiness of the ground. Went to The Pas in the afternoon.

Friday, July 20th, 1860. Took breakfast this morning with Mr. Watkins. Observed altitudes of \odot for Lat[itude] and time. In the afternoon went over to Mr. Watkin's, and took tea. Had quite a talk with them afterward. Left about sunset, and ran down stream for home.

Tuesday, July 24th, 1860. Men paddled all last night; arrived at Cedar Lake House between 2 and 3 a.m. Ran down to the portage, arriving there early in the forenoon. Had portage finished by about 10 o'clock. Arrived at the mouth of the Saskatchewan before 2 p.m.

Wednesday, August 8th, 1860. Awakened after 5 a.m. by the landing of the boat. Found that we were 2 or 3 miles past Willow Is[land]. Arrived at the mouth of the Red River at 10 a.m. Started up the river at $11\frac{1}{4}$ with side wind. Passed many Ind[ian] lodges. Arrived at Stone Fort, (or Lower Fort Garry) at $7\frac{1}{2}$ p.m.

Thursday, August 9th, 1860. Slept last night at Fort, in civilized bed. At 8 a.m. started for Fort Garry on foot, arriving at $1\frac{1}{2}$. Roads were very bad the first few miles. Found that steamboat had not arrived, or been heard from, though she was due Saturday last. Wrote an account of our voyage for the Nor'Wester. Stopped at Royal House. Mr. Lilly up to-night.

Saturday, August 11th, 1860. All kinds of stories about the steamer. In the

evening learned from Gov[ernor] Mactavish that she was aground on Goose Rapids.

Wednesday, August 15th, 1860. Examined pocket sextant which Dr. McKinney talks of buying. Took \odot altitudes at noon for Latitude.

Friday, August 17th, 1860. Took Sun altitudes morning and noon for time and Latitude. The latter differs 1' from previous determinations.

Saturday, August 18th, 1860. Took equal altitudes of Sun in morning and afternoon for time.

Monday, August 20th, 1860. Observed Lunar distances for Longitude. Results are not very good. Sextant seems to have an error of eccentricity of about 1" per degree.

Tuesday, August 21st, 1860. Observed a set of Lunar distances from Mars, and isolated ones from Antares and α Aquilae. We expected to start to-morrow, our party consisting of Ferrel, Scudder & myself, Rev. Mr. Taylor & 2 ladies, Fonseca of the West, young Car[r]uthers of Trinity College, Canada, and Messrs. Mason and Perkins of the Cambridge Law school.

Wednesday, August 22d, 1860. Getting ready to start over the plains with Mr. McKinney. Dr. M[cKinney] gave me \$1.16c to get almanacs for 1861–2. Started at 3½ p.m. in ox-wagon for Pembina Crossing and St. Paul.

Tuesday, August 28th, 1860. Started about sunrise, crossed a singular slough. Crossed a hard bottom covered knee deep with liquid black stagnant marsh mud, through which the men waded. Camped alongside an Indian or other circular mound 30 feet in diam[eter] & 4 high. Place is called Snake Hill, and the river Snake River.

Saturday, September 8th, 1860. Stopped opposite Fort Ripley, was ferried across about 10 or 11; walked up to the Fort, and spent the day there. Was introduced to Capt. Davis, Col. Abercrombie, Rev. Mr. Geer, Dr. Ball(?), Major Pat-ten, Mr. and Lieutenant Spencer. Officers in great stew about a supposed new star.

Monday, September 10th, 1860. Scudder & I concluded to walk on to St. Paul on Wednesday. In the afternoon walked on ahead of the train, crossed the ferry at Sauk Rapids, and went to St. Cloud.

Wednesday, September 12th, 1860. Arrived at Anoka shortly after 11 a.m. From there walked very slowly, and got into stage about 3½ o'clock, about 3 miles above Manomin. Arrived at St. Paul about dark, went to P.O., and got a letter from Capt. Davis, enclosing draft for \$89. Capt. D[avis] had written to Mr. Terry expressing apprehension for our safety. Called on Gov[ernor] Ramsay.

Thursday, September 13th, 1860. Went on board the steamboat Alhambra (stern wheel boat) at 8 a.m. Boat aground frequently.

Wednesday, September 19th, 1860. Arrived at Albany at 9 a.m. Arrived in Boston at 4^h 40^m p.m., went to the office in Cambridge, and saw Capt. Davis.

Saturday, September 22d, 1860. Ferrel arrived this morning. ... Made meridian observations of Sun with sextant.

Monday, September 24th, 1860. Fixed up some of our instruments in the morning, and settled accounts with Capt. Davis. In the evening went to Prof. Cooke's Laboratory, where I saw Prof. Henry, and had quite a talk on physical subjects, and viewed several electrical experiments. [Joseph Henry was a physicist who carried out extensive research in electricity and magnetism. In his honour, the scientific unit of self induction, the "henry," was named after him.]

Tuesday, September 25th, 1860. In the evening measured distances between Mars & Polaris to test sextant, and observed some transits at Cloriseden Observatory.

Wednesday, September 26th, 1860. Went to the observatory this afternoon, and talked with Bond on various subjects. Suggested to him my experiment to determine the velocity of physical rays for the Bryden prize.

3. METHODOLOGIES AND TECHNOLOGIES: PAST AND PRESENT

Established methods for the determination of latitude and longitude underwent significant changes during the 19th century. With the arrival of the electric telegraph and through the use of exchanges of signals between observatories, differences of longitude could be obtained with improved precision. From Fort Garry to the eclipse site, in 1860 Simon Newcomb was well removed from access to the latest advances in technology. As the excerpts from his diary show, latitude determinations were carried out (July 9th & 10th) and checks of his chronometer made against local time (July 9th) and Greenwich time (July 11th). Newcomb attempted to determine longitude by observing lunar distances (July 11th &

16th). Today, with an appropriate receiver, a daily check of his chronometer could have been performed by picking up short-wave signals broadcast across Canada for the benefit of surveyors in the field. Again, including stop-overs at Toronto and Winnipeg, in 1996 Newcomb could travel by air from Boston to The Pas in less than eight hours. In 1860 his journey to the eclipse site required 47 days of travel — a difference of some 1120 hours.

What instruments would be carried by an eclipse party during the last decade of the 20th century? Modern equipment should include a Global Positioning System, a receiver approximately the size of a portable telephone which, when coupled with a network of satellites circling above the Earth, would provide the party not only with a new level of accuracy in determining its position on the Earth's surface within the narrow band of totality but also a time check to within a fraction of a second.

4. CONCLUSION

The 1860 diary of Simon Newcomb provides historians of science with an exciting and detailed account of an expedition to a remote region of Canada to view a total solar eclipse. Neither hardships experienced during that lengthy trip nor the disappointment of being clouded out at totality deterred Newcomb from making major contributions to the science of astronomy throughout the remainder of his life.

The University of Saskatchewan's microfilm copy of Newcomb's diary forms an important heritage link to science of an earlier century, a time when airborne eclipse expeditions were never envisaged. Yet, at that period, the desire to enhance scientific knowledge about the Sun was stimulating scientists with the same fervour apparent throughout the 20th century. Impressive advancements in both instrumentation and transport have removed most of the hardships experienced by Newcomb in his study of the 1860 solar eclipse.

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