

COMET TALES FROM INDIA: DONATI'S COMET OF 1858 (C/1858 L1 DONATI)

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Abstract: On 02 June 1858 at the Observatory of Florence, Giambattista Donati (1826–1873) discovered a faint nebulous patch what was destined to become one of the most brilliant comets in history. Named after him, Donati's Comet (1858 VI; C/1858 L1 (Donati)) enthralled sky watchers in Europe and elsewhere like never before. This paper brings together tales of the observations of this comet made in India. Ironically, the celestial visitor happened to rise in India's most turbulent times. It was seen by many as a baleful sign out to ruin and observed by some for science.

Keywords: Great Comets; Donati's Comet, Comet C/1858 L1 (Donati); John Henry Pratt; Eyre Powell; J.F. Tennant; William S. Mackay; Madras Observatory

THE COMET.

TO THE EDITOR OF *THE TIMES*.

Sir, - Will Mr. Hind, or any Galileo of the present day, tell us what this comet of Donati is? Is it an old friend, or a brand new one, and why is it called Donati's comet? ... Mr. Hind's letter of this day makes it clear that this is not Halley's comet, nor that of 1811. Is it that of 1264 and 1556 which Dr. Halley reckoned would return in 1860, but which Mr. Hind thought would revisit us in 1858? Is it Biela's? Is it Faye's? Is it De Vice's? Is it Brorsen's? Is it the one that appeared B.C. 43, and was regarded by the Romans as the soul of Julius Caesar, recently murdered ... I trust Mr. Hind, or someone, will take compassion and write something adapted to my – the meanest capacity – some *Little Laplace*, or *Lucid Lessons for Lispering Learners*.

Above all, will he throw some light on Donati, and come to the rescue of

Your obedient servant,

Acton, Sept 20.

IGNORAMUS? (*The Times*, 1858)

1 INTRODUCTION

On the evening of 2 June 1858 at Florence Observatory Giambattista Donati (1826–1873; [Figure 1](#)) noticed between the constellations of Leo and Cancer a faint nebulosity the size of about one-tenth of the angular span of the Moon, which would evolve to be one of the most spectacular comets of the nineteenth century and come to bear his name ([Donati, 1858: 271](#)). The comet was designated 1858

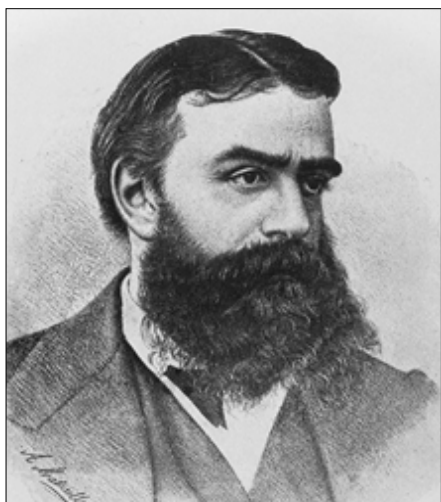


Figure 1: Giambattista Donati (1826–1873) (https://en.wikipedia.org/wiki/Giovanni_Battista_a_Donati#/media/File:GB_Donati.jpg).

VI, now C/1858 L1 Donati. In no time, it turned out to be none of the comets mentioned in the aforementioned letter of 20 September to *The Times* newspaper.

Donati's Comet was a naked eye object for 112 days. It was noticed to have developed a tail by 14 August. In September, the tail grew very quickly and brightened so that it was visible to the naked eye. On 5 October, the tail was estimated $\sim 40^\circ$, or 80 million km in space, and it grew to 60° by 10 October. The American astronomer George P. Bond (1825–1865) prepared a monograph titled *An Account of Donati's Comet of 1858* that appeared in *The Mathematical Monthly* and thereafter as a bigger monograph ([Bond, 1862](#)). Aimed at a wide audience, it described the apparition in detail. It presented 51 engravings of the telescopic and the unaided-eye view of the comet. The comet began to trail the Sun on 22 September and passed perihelion on 30 September. Ever since its discovery, the comet was approaching the Earth. It arrived in the plane of the Earth's orbit about vertically and appeared in the sky moving south-east. On 10.875 October it made its closest approach to the Earth, at a distance of 0.537877 au when it was a magnificent object. In fact, the first ten evenings of October presented the most impressive view of the main tail, which measured in length

between 28° and 35° on 4 October, 30° and 41° on 9 October, 40° and 43° on 11 October (when it was 10° – 16° in width), before diminishing to 33° on 15 October, 20° on 16 October and only 5° on 17 October. On 21 October, the Comet was at apparent visual magnitude 3.7 and only displayed a 5° tail. By 4 December, the comet had faded to between visual magnitude 5 and 6 (Kronk, 2003).

Donati's Comet was the first comet to be photographed, on 27 September 1858 by W. Usherwood in England on a collodion-coated glass plate (prints untraceable) and by George Bond on 28 September at Harvard using a 15-inch refractor (Pasachoff et al., 1996). A pioneer of stellar spectroscopy, Donati (Figure 1) was the first to photograph the spectrum of a comet, Comet Tempel (C/1864 N1) in 1864, and this opened the floodgates in researching the physics and chemistry of comets—and hence the Solar System. Earlier, J.R. Hind (1823–1895) had speculated that if the comets of 1264 and 1556 were one and the same, then it must return in 1848 (Hind, 1848). This led some people to believe that when the Donati's Comet appeared in 1858 it was possibly a delayed apparition of the comet of Charles V.

Donati's Comet also created excitement among people working in the arts and the print media (see Olson and Pasachoff, 1998: 227–244 and associated plates), and it featured in engravings, paintings and poetry and was widely portrayed in the pages of *The Times*, *The Illustrated London News*, *Le Monde Illustré*, *The New York Times*, *The Punch*, etc.

The evening of 05 October in 1858 was one like never before. John Hind had pointed out that the comet was to make a *tête-à-tête* with Arcturus ($-0^m.05$), the fourth brightest star in the night sky. The encounter, apparent of course, turned out to be a rare event, and unprecedented in living memory. As the Sun set over Europe, the sight of the comet close to Arcturus began to so mesmerize viewers that it became the subject of many paintings. Those interested had a rare view of a star brighter than the first magnitude being gradually occulted by the comet from a little above its nucleus, with Arcturus shining through the densest part of the tail.

There are several beautiful depictions of Donati's Comet on 05 October 1858 by artists, including William Turner of Oxford (1789–1862), who was well-known for his watercolor landscapes. In fact, one such artwork in the Austrian astronomer Edmund Weiss' 1888 edition of his famed *Bilderatlas der Sternwelt*,

has remarkable astronomical detail. Weiss had been actively observing Donati's Comet, as evidenced by many of his communications cited in Bond (1862).

Between them, the various depictions of the head of the comet placed it a little south-east of Arcturus, and the date implied was 05 October—even when not specified. However, for many observers in Europe, as the occultation progressed, the head of the comet was already quite near the horizon or had even set. In fact, on 05 October 1858 those in Europe did not see the head of the comet past Arcturus as shown in the many of the book illustrations. Some of the artworks drew on images in Bond's (1862) report, where his drawings also included thin lineal plasma tails (e.g. see Figure 2) that often were not visible or obvious at many locations due to local sky conditions.

Meanwhile, in his book *Le Ciel*, Guillemin (1877) includes an impressive view of the comet seen over Paris and near to Arcturus (Figure 3). This view, including Notre Dame Cathedral reputedly dates to 4 October and may appear in order, but Crovisier (2019: 31) recently determined the vantage point of observation by triangulation and found that azimuthally, the comet actually was further west, outside the field of the picture.

Among the celebrated watchers of the Donati's Comet were Abraham Lincoln (1809–1865) and Stephen Douglas (1813–1861). Lincoln "... greatly admired this strange visitor ..." and on 14 September, while in Jonesboro, Illinois, he "... stayed up to look at it for a solid hour one night." (Finacom, 2008). At the time, Lincoln and Douglas were in the middle of the famous 'Lincoln-Douglas Debates of 1858' that went from 21 August to 15 October prior to Lincoln's election as the President of the United States. As Finacom (2008) notes,

Comets then were still, even in the United States, seen with suspicious awe and fear. The Great Comet of 1811—the most vividly visible until Donati's appeared in 1858—was regarded by some as the precursor of the War of 1812.

Bond (1862), Clerke (1908: II: Ch. X), Vsekhsvyatskii (1964), Olson and Pasachoff (1998) and Kronk (2003) all give detailed accounts of how the comet C/1958 L1 (Donati) grew to become an unforgettable spectacle, while Gasperini et al. (2011) and Sterken (2018) discuss its cultural impact.

Table 1 gives the orbital parameters as computed by G.W. Hill in 1865 and listed in its database by JPL (2017).



Figure 2: A screen shot of Plate XIII in Bond (1862: 42), titled '1858 October 5. Photograph taken from a sketch of the Comet and neighboring stars.'



Figure 3: Donati's Comet over *Notre Dame de Paris* on 04 October 1858 (after Guillemin, 1877: Frontispiece).

2 DONATI'S COMET: THE SCENE IN INDIA

Early nineteenth century India saw the advent of the Indian Renaissance that brought European science in Indian languages to the interested through the efforts of several prominent figures (Ansari, 2002). English education had already struck roots, and so too did the shaping of the school curricula, and the publication of low-priced school books in English and Indian languages.

On the political front, the East India Company had in the last hundred years brought a major part of India under its control, and British dominance had begun to overwhelm India's political, cultural and economic life. Born of an accumulated discontent over their long suffering and driven by religious feelings, the revolt against the British that broke out among the ranks in the cantonment at Meerut on 10 May 1857 soon turned into the Great Uprising that shook the foundations of colonial power in India. By July 1857, it had swept the country. There

Table 1: The elements of Donati's Comet (after JPL 2017).

Eccentricity e	0.996295
Perihelion distance q	0.578469 au
Angle of Inclination i	116°.9512
Longitude of Ascending Node Ω	167.3044 (2000.0)
Argument of Perihelion ω	129.114;
Time of Perihelion Passage t_p	1858 September 30.4645

are excellent works of history on India's Great Uprising of 1857 and the British response to it, in English, Urdu and Persian that draw on original archival material, administrative records, contemporary newspapers, personal diaries and oral history accounts. Too numerous to mention, they make it increasingly clear that it was India's War of Independence, pan-Indian and across castes and communities.

By chance, Donati's Comet appeared and reached its full glory during the most tumultuous times in India. The Great Uprising against the British had failed, the Mughal Empire had fallen, and most male members of the Royal family had been slaughtered (Dalrymple, 2006: 423; Dehlvi, 2017: 138).

Here we recount tales of Donati's Comet from India.¹ These are from observers with different backgrounds and in various situations. There were many who saw in the apparition a fiend out to unleash terror with its fiery tail. Distant from the turbulence, a few interested individuals made observations of the comet for science. Some of them had the necessary wherewithal and technical expertise. Although resident in different parts of the country, their roots lay overseas and worked to their advantage.

The outline map of mainland India in the Figure 4 shows the locations mentioned in the text, including those where the comet was observed. To retain the historical flavour, I have used old spellings of the place-names.

3 DONATI'S COMET: THE MODERN OBSERVATIONS

3.1 Archdeacon Pratt's Note

The Calcutta newspaper *Friend of India* dated 11 November 1858 carried on page 1064 a copy of a note by the Venerable John Henry Pratt (1809–1871; Figure 5), Archdeacon of Calcutta (now Kolkata), on the sighting of a comet that he had submitted to the *Asiatic Society* (Pratt, 1858: 373–374):

This comet is the same as that seen by Dr. Donati at Florence in June last. Mr. Hind has published one or two letters in the *Times* giving the results of his observations upon it. It is not, as was at first hoped, the 1556 or Charles Vth comet, which may yet come. From 1858 to 1861 is the range which Mr. Hind has given it.

Regarding this, or Donati's comet Mr. Hind shows, in his letter dated September 13th, that on the 5th and 6th of October it would be near Arcturus – which you may remember we observed – and that it would pass its descending node near Venus – which also we saw here plainly enough on

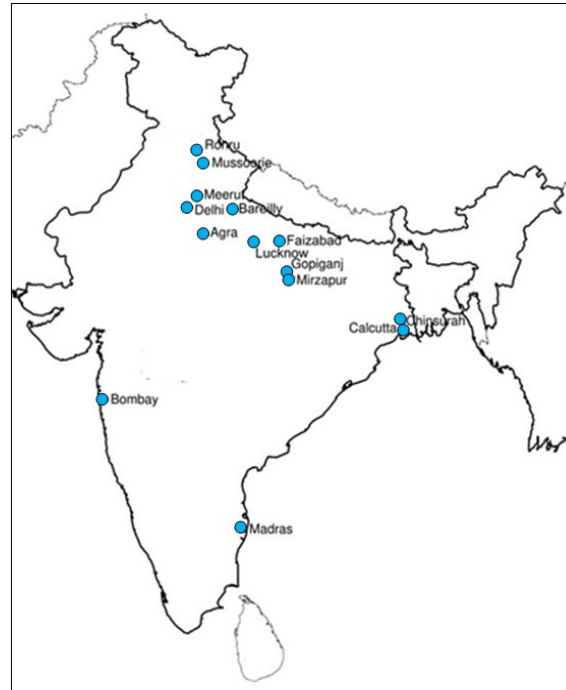


Figure 4: A map of mainland India showing localities mentioned in this paper (map: Wayne Orchiston).

the 17th or 18th October. The motion of the comet is retrograde; for Venus is come to this side of the sun from the opposite side by the left, whereas the comet is come round by the right. The motion round the sun is consequently opposite to that of Venus and the other planets. This is fatal to its being Charles V's comet, if, as I believe is the case, that comet's motion was direct. No perturbations from the Planets could account for such a change.

The newspaper then commented that "We suppose that is final, at least we shall get no better opinion than the Archdeacon's in India".



Figure 5: John Henry Pratt (1809–1871), Archdeacon of Calcutta from 1850 until his death (after O'Connor and Robertson, 2005).



Figure 6: Eyre B. Powell (1819–1904) (<http://www.presidencycollegechennai.ac.in/UI/CollegeHistory.aspx>).

On 5 October, the Comet's head was close to Arcturus, a little north-west of it. As for the reference to Charles V in his communication, initially it had been suggested that Donati's Comet was the long-expected comet of 1556 or Charles Vth Comet that Pratt now dismissed. The comet of 1556 (now C/1556 D1) had appeared in the same year that Emperor Charles V (1500–1558) abdicated the Spanish throne. [P INGRÉ \(1783\(1\): 506\)](#) has written about this apparition:

The appearance of this Comet produced a very singular effect, according to several writers. It frightened the Emperor Charles-V: this Prince had no doubt that his death was near. He exclaimed ... 'in this bright sign I read my imminent end' ... If we are to believe the historians I have cited, this panic contributed a lot, and induced Charles V to cede a few months later the Imperial crown ... (my English translation).

Pratt was a mathematician and astronomer, and author of *Mathematical Principles of Mechanical Philosophy; Scripture and Science not at Variance*, and of *On Attractions, Laplace's Functions and the Figure of the Earth* (1860) where "... he gave 26.9 miles as the difference between the equatorial and polar axes, quite a good result ..." ([O'CONNOR and ROBERTSON 2005](#)). He also published several papers in scientific journals. The [ALLEN'S INDIAN MAIL \(1858: 943\)](#) article on *Science in Asia* accords due regard to his work observing that

Table 2: Powell's values for the orbital elements.

Perihelion distance	0.577974 au
Inclination of the orbit	63° 5' 58"
Longitude of the Ascending Node	165° 17' 52"
Longitude of perihelion	14° 26' 23"
Perihelion passage	1858 September 29.9908 G.M.T.
Motion	Retrograde

"India is to be the battlefield on which the figure of the earth is to be finally determined." Henry Pratt was elected Fellow of the Royal Society in 1866.

Note that the paper *Friend of India* was brought out by the Serampore Mission Press, in Serampore near Calcutta. The well-known Kolkata daily *The Statesman* dates back to the year 1875, and actually descended from two Calcutta newspapers, *Friend of India* and *The Englishman*, founded early in the nineteenth century.

3.2 Observations by Eyre Powell

Donati's Comet also was observed from Madras (now Chennai) by Eyre B. Powell (1819–1904; [Figure 6](#)), a Cambridge Wrangler in Mathematics who in 1841 became the first Principal of the High School at Egmore. This school evolved into the Presidency College in 1855, and from this the University of Madras was founded in 1857. Powell rose to become the first Principal of the Presidency College serving until 1862, and thereafter he was the Director of Public Instruction in the Madras Presidency until 1875.

Eventually, Powell had an refractor, and he often observed astronomical objects and events, sometimes in collaboration with Captain W.S. Jacob, the Astronomer at Madras Observatory. Powell published several papers in *Monthly Notices of the Royal Astronomical Society* on a range of topics, including double stars, comets and the enigmatic variable star *Eta Argus*. In 1866, he was made a *Companion of the Order of the Star of India*.

At Madras, Donati's Comet was first seen on 30 September soon after sunset, through gaps in the clouds ([Powell, 1858: 62](#)). On following evenings, the comet was noted to be brightening rapidly, and became "... a truly magnificent object." Powell's telescope had yet to arrive from England, so from 3 October until 4 November he used a sextant to carefully measure the comet's position. He took the difference in longitude between Madras and Greenwich as 5^h 21^m, and then proceeded to calculate the comet's orbital elements (which are shown in [Table 2](#)).²

[Powell \(1858\)](#) noted that on 2 October the nucleus of the comet appeared large and bright but was more ragged and fainter than Arcturus, and the tail was about 16° long. On 3 October, the tail was brighter and longer. Powell saw a 'cuspidated feature' around the nucleus, its semi-circular edge being in the direction of the Sun. By 4 October, the nucleus had brightened to match Arcturus, and the

cuspidated appearance became more evident although the outline of the envelope still was not distinct. Powell also noticed for the first time a dark axial space down the envelope, and that the tail had grown to about 24° in extent. Just to check, the apparent position of the comet was calculated with JPL's (2017) Horizons System for 4 October at around the time of Powell's observations and it matched very well his measured values. No observations were made on 5 October, possibly because of clouds. On 8 October, the nucleus looked as bright as Mars or α Lyrae with the envelope resembling a pen, narrow at the head and then spreading like the feathers of a quill. For observations on 12 October, Powell mentions of the moonlight and that he found that the nucleus of the comet was a bit dimmer than on 8 October, and with a fainter but longer tail. On 16 October, the nucleus appeared large and diffused, and the convex side of the envelope looked brighter than the other side. Full Moon was on 22 October. By 27 October, the comet had become very faint and the tail had diminished to between just 4° and 5° . Powell (1858) mentions that the observations were made with a 3.5-ft long refractor having an aperture of 2.75 inches.

3.3 Observations by Captain J.F. Tennant

Captain James Francis Tennant (1829–1915; Hollis, 1915; Figure 7), who later would head the Madras Observatory from October 1859 until October 1860 (when Norman Pogson was appointed the Astronomer), observed comet C/1858 L1 (Donati) from Mussoorie at an altitude of about 2005 m in the foothills of the Garhwal Himalayas in Uttarakhand. Mussoorie was already very popular among the British as a leisure destination, and for the magnificent views it offered of the Doon Valley and the Himalayas.

Tennant's observations span the brief period 5–12 October. He communicated his results to the Astronomer Royal for Scotland, Italian-born Charles Piazzi Smyth (1819–1900), where he gave positions of the comet and also the comparison stars he used (Tennant, 1859). Using the method that Sir John Herschel outlined in his contribution on Astronomy in the *Encyclopaedia Metropolitana*, Tennant computed the parabolic elements of Donati's Comet from the observations he made on 5, 7 and 12 October. These are given in Table 3.

Tennant (1859: 186) ended his communication by reporting that

On the 10th of October the tail of the comet extended to a point in the line be-



Figure 7: J.F. Tennant (courtesy: Indian Institute of Astrophysics Archives).

tween β Herculis and η Coronae; distance from β one-third of distance of η Coronae.

His results appeared in brief in the *Journal of the Asiatic Society of Bengal* (Tennant, 1858: 373) where the elements also were given as in Table 3 but with the perihelion distance listed as 0.5752358. Tennant (ibid.) observed that the comet followed the course predicted by Mr Hind, passing Arcturus on 5 and 6 October, with its descending node near Venus on 17 and 18 October. To this he added that the elements "... differ totally from those of Mr. Hind's expected Comet, that of 1556." Although Tennant was not able to make any observations until 5 October, he still believed that the elements he derived would be fairly accurate, adding that "I have seen no English orbit and I doubt if any has yet reached India". The apparent positions of the comet as calculated with the Horizons System for 5, 7 and 12 October corresponding to the times of Tennant's observations match very well with his measured values. On 5 October, at the time of his observation ($\equiv 14^{\text{h}} 03^{\text{m}} 16^{\text{s}}$ Greenwich time), according to our computations the head of the comet would have been just 0.88° northwest of Arcturus.

Where exactly in Mussoorie was Tennant stationed? He gave his location as "Lat. 30°

Table 3: Tennant's values for the elements.

Perihelion distance	0.575236 au
Inclination of the orbit	$66^\circ 20' 35''$
Longitude of Ascending Node	$168^\circ 25' 11''$
Longitude of perihelion	$16^\circ 36' 4''$
Perihelion passage	1858 28 September $16^{\text{h}} 16.5^{\text{m}}$ G.M.T.
Motion	Retrograde

17° 19' N., Long. 5^h 12^m 17^s.7 E.". The meridian of the longitude lies near Gun Hill in Mussoorie but according to the latitude, the point of observation was down on the plains in the present-day Jogiwala area in Dehra Dun (at an altitude of around 450 m), a city in the foothills and where the Survey of India has its headquarters. By the hill road, Mussoorie is 35 km from Dehra Dun. An error of 10' implies being off the location by more than 18 km on ground. Such an error is unlikely, and I believe that the 17' in the quoted latitude is a mis-print and the intended value was 27' (see [Note 2](#)).

Dehra Dun was part of the Garhwal Kingdom and following a treaty between the Kingdom of Nepal and the East India Company it was annexed by the British Empire in 1816. Meanwhile, in 1832 Mussoorie was to be the last point in The Great Trigonometric Survey of India (see [Phillimore, 1945–1968](#)).²

Born in Calcutta, James Francis Tennant joined the Bengal Engineers in 1849 as a Second Lieutenant, and was then attached to The Great Trigonometrical Survey of India ([ibid.](#)).

Table 4: Mackay's elements vs. European elements.

	Mackay	European
Perihelion dist.	0.5753	0.579 au
Inclination	63° 39'	63° 2'
Long. ascending node	165° 15'	165° 19'
Perihelion long.	37° 4'	36° 13'
Perihelion passage	Sept. 29d 18h 21m	Sept 29d 23h
Motion	Retrograde	Retrograde

He also participated in the 1868 and 1871 solar eclipse expeditions ([Orchiston et al., 2017](#)) and observed the 1874 transit of Venus from India ([Kapoor, 2014: 121–123](#)).

In 1910, Tennant also appears to have observed Halley's Comet (1P/Halley) from Mussoorie. He mentions that the observations were made on 16 May from "... somewhere in the Himalayas ..." ([Tennant, 1910: 297](#)), and gives the latitude and longitude as 30° 27' 40" N and 78° 6' 30" E, at an altitude of 7500 feet. For these coordinates, the observations most likely were made from Lal Tibba, the highest scenic point in Mussoorie.

3.4 Observations by the Reverend Dr W.S. Mackay

The Reverend Dr William Sinclair Mackay (1807–1865), a missionary at Chinsurah in the Hooghly district used a sextant and an old ship's chronometer to observe Donati's Comet on 6, 18 and 30 October 1858. From these observations he computed the orbital elements (see [Table 4](#)), and he communicated these to the Astronomer Royal for Scotland, Charles

Piazzi Smyth (Mackay, 1862: 161).

Mackay's elements compared well with the European determinations that he said were received about one month later. He emphasized that his observations were well spaced in time and so corresponded to a longer arc for the purpose of orbit calculation. His results later appeared in the Serampore paper *Friend of India* as a part of his account of the observations of the Great Comet of 1861 (C/1861 J1, discovered by Tebbutt—[Orchiston, 2017](#)). Dr Mackay's 1858 values are similar to Hill's orbital elements, as listed by [JPL \(2017\)](#). Sextant measurements are not considered very accurate, for, at the very least, the instrument used for the observations should be securely mounted. Accurate time-keeping was equally important. Nonetheless, he was able to compute realistic orbital elements, a testimony, surely, to his experience and passion for observing. Compare, for example, the longitude of perihelion that he computed with those derived by Powell ([Table 2](#)) and Tennant ([Table 3](#)) whose values differ from the standard value substantially. Powell's observations extended over a month, whereas Tennant only made observations from 5 to 12 October.

There is not much biographical information available about the Reverend Dr William S. Mackay except for his missionary involvement in India, as given in [Hunter \(1873\)](#). The Reverend was associated with the Bengal Mission of the Free Church of Scotland that was established in 1830. Calcutta was then the colonial capital of India, and the Reverend Dr Alexander Duff (1806–1878) arrived in the city in May 1830 as the first overseas missionary of the Church of Scotland in India. On 13 July 1830, he founded the General Assembly's Institution on Chitpur Road with just five boys. In 1908 the Institution evolved into the present Scottish Church College ([SCC, 2020](#)). The Free Church Institution and the General Assembly's Institution continued side by side. As [Hunter \(1873: 84\)](#) wrote:

On Monday, the 4th March 1844, the institution opened with teachers, monitors, and 791 pupils present on a roll of upwards of 1000, only it was now in Nimtollah Street, and not, as previously, in Cornwallis Square. Nor was the library entirely destitute of books. Friends, European and native, had made donations collectively amounting to about 1100 volumes, whilst a Herschell's ten-foot telescope, also presented to the mission by Mr Stewart, son of Dr Stewart, formerly of Moulin, Dingwall, and the Canongate, Edinburgh, became the nucleus of a fresh set of apparatus.



Figure 8: The Madras Observatory, Nungambakkam, 1880; the building is no longer in existence (courtesy: Indian Institute of Astrophysics Archives).

To this, [Smith \(1899: 209\)](#) also added a reference to Dr Mackay's observatory:

Dr Mackay, who had built his usual observatory on the roof, was gladdened by the donation of a Herschel ten-foot telescope from the son of Dr Stewart ...

I plan to provide further information about the Reverend Dr Mackay's astronomical activities in a later paper.

4 MADRAS OBSERVATORY AND DONATI'S COMET

Madras Observatory ([Figure 8](#)), in existence since 1786/1792 ([Kochhar and Orchiston, 2017](#)), has no published account on Donati's Comet. However, the comet was observed by Major W.K. Worster (1811–1882) of the Madras Artillery when he substituted at the Observatory for the Director, Captain W.S. Jacob (1813–1862), who had to leave his post in April 1858 on health grounds and return to England ([RAS Council 1859](#)). Subsequently Major J.F. Tennant from The Great Trigonometrical Survey, took over the Observatory, from 13 October 1859 to October 1860 when Norman R. Pogson was appointed Astronomer. So, Madras Observatory was between Directors when Donati's Comet was visible,

and no observations were reported or published by the Observatory, except those made by Major Worster. For details of Madras Observatory and its role in the development of modern astronomy in India, see [Kochhar and Orchiston \(2017\)](#).

Importantly, Markham noted in 1878 that there were 25 observations of Donati's Comet and a multitude of other observations that remained unpublished. These arrears were to pose a mammoth task for Norman Pogson after he arrived at the Observatory ([Markham, 1878: 332](#)):

When Mr Pogson took charge of the observatory in February 1861 there was a catalogue of about 2,200 stars, chiefly selected from Taylor's Madras catalogue, and that of the British Association, observed between 1853 and 1858, awaiting completion. The observations to be incorporated in this catalogue will be little under 10,000, and much had already been done towards preparing it for the press. There are 1,331 observations of the sun, 345 of the moon, 1,680 of the principal planets, 333 of the minor planets, and 25 of Donati's comet of 1868, besides the mean places of the 144 Nautical Almanack stars from 1853 to 1858, observations of Mars at

the oppositions of 1854 and 1856, of moon culminations for determination of longitude, and a long list of occultations of planets and fixed stars, and of the phenomena of Jupiter's satellites ...

Note the typographical error in the above quotation, where one must substitute the year 1868 for 1858.

5 A TALE OF TWO EMPIRES

The revolt against the British dominion begun on 10 May 1857 by the soldiers of the East



Figure 9: A portrait by Ágoston Schoefft, ca. 1854 of Bahādur Shāh II, the last Mughal Emperor of India (r. 1837–1857); Zāfar, his poetic name, means victory (Wikimedia Commons).

India Army eventually brought a great catastrophe to Hindus and Muslims who joined in the struggle against the British. A large contingent of the soldiers proceeded to Delhi. On 11 May they met the Emperor Bahādur Shāh Zāfar (r. 1837–1857; Figure 9) and looked up to him for leadership (Dehlvi, 2017: 60). Zāfar was 82 and reluctant, for he knew that his writ did not extend beyond his abode, the Red Fort. Delhi had already been entrusted to the British in 1803. Yet he consented and gave his name to the cause. The word spread and

support soon came from several states. The revolt then spread to many parts of northern and central India. By July 1857, it engulfed the whole country. India's War of Independence culminated in the final assault of the British over the Mughal Empire.

Late in September, the British began to re-establish their hold. Delhi was taken by the British on 20 September 1857 and Zāfar was incarcerated the following morning by Captain William Hodson (Dalrymple, 2006: 394; Husain, 1958: 280–281). The following day Charles Saunders, the Commissioner of Delhi

... arrested thirty Timurid princes, including the Badshah's sons, grandsons and sons-in-law, and murdered them outside the walls of Delhi. He sent their heads to the emperor. (Dehlvi 2017: 138).

The octogenarian Emperor ended up a state prisoner. Beginning on 27 January 1858, he was made to face trial on charges of revolt, treason and murder and was convicted and sentenced to be exiled. In the early hours of 7 October 1858, a convoy escorted by the 9th Lancers proceeded to take the 'ex-King' Zāfar, his wife Zinat Mahal and two sons to Calcutta to be eventually imprisoned in Rangoon for life. Rangoon was then part of the British India. Lieutenant Edward Ommaney, who was an Urdu and Persian scholar, escorted the convoy, taking due care of the prisoners and reporting the proceedings of the long journey back to Saunders, the Commissioner of Delhi (Dalrymple, 2006: 444). The convoy, by land route, reached Allahabad (now Prayagraj) on 13 November 1858, and eventually proceeded to its destination.

Coincidentally, just when the long arduous journey began, it was also the time when Donati's Comet was visible in the evening sky in all its glory. In his communications Lieutenant Ommaney makes no mention of it, and that everyone in the party, and above all the ex-King was there to see it. There is nothing on record to show Zāfar's reaction, for, had there been any, Lieutenant Ommaney would certainly have recorded it. That there is no reaction on record by the Last Mughal of India to an apparition visible throughout the country is very surprising.

While comets are not harbingers of misfortune, here was one that dared to be precisely that for those in the convoy suffering from the recent emotional shock of losing only of their loved ones but also their regal power. In Mughal history, the irrational side of celestial phenomena, astrology and superstition prevailed in life. Astronomical observations were

required generally for astrological purposes, to precisely determine the timing or ascertain the auspiciousness of an event. Be it a royal birth, eclipses, omens or strategic marches, Hindu astrologers were invoked (Schimmel 2004: 139–140). At such a juncture, the emergence of a large and bright comet could not be other than a baleful sign on the side of the devil and out to cause ruin only (Kapoor 2018b).

A few weeks later, on 1 November 1858, the British Crown took over through a Proclamation by the Queen Victoria, whereby the political authority of the East India Company ceased to exist and the Government of India passed to the management of the Crown. Incidentally, the Queen herself had seen Donati's Comet:

Next month [i.e., September 1858] as she rode home across the darkening hills, she saw Donati's comet flaring in the sky with a star *distinctly through its tail*. To the country, Donati's comet heralded war. War had already broken out on the other side of the world. (Longford, 2019: Ch. XIX; his italics).

6 DONATI'S COMET IN SOME BRITISH MEMOIRS

6.1 G.R. Elsmie's Account

George R. Elsmie (1838–1909: Figure 10), a British Civil Officer who served in the Punjab during 1858–1893, recounts sighting a beautiful comet in 1858 (Elsmie, 1908). He had arrived in Calcutta in February 1858 and subsequently opted for the Punjab as the province to work in, where he joined as the Assistant Commissioner. He served in Punjab in various positions, was the Vice-Chancellor of Punjab University during 1885–1887 and was made a Companion of the Order of the Star of India in 1893.

On 10 October Elsmie and his cousin James Simson watched the comet on their way from Gopiganj, a small town 40 miles from Benaras (Varanasi), to Mirzapore (Mirzapur). Simson was the Joint-Magistrate of Mirzapore, and at the time happened to be at work in a camp at Gopiganj. Elsmie (1908: 39) shares their experience in the following words:

After all important business had been transacted J.S. and I, grit with pistol-belts, started off in buggy for Mirzapore, which is



Figure 10: G.R. Elsmie in 1891 (after Elsmie, 1908: 354).

about fourteen miles from Gopiganj. We drove for six miles, where horses met us, and then we cantered to the Ganges, crossed in a boat just as the stars had come out. The scene was most lovely; we were silently crossing the river, which was as smooth as glass, and in the west was to be seen the most beautiful celestial trio I ever beheld; rather high up in the sky a gorgeous comet seemed to be diving down like a falling rocket with a magnificent tail of light; on the horizon the new moon, tinged with red from the last beam of the sun, was about to set, and a little to the left, about as high as the comet, Venus was shining in all the glory of her silvery light. It was a truly gorgeous sight. I don't know whether this comet is visible in England, but we have seen it here for ten nights, and a worthy sight it is ...

I am afraid I let my imagination run away with me as to the cause of the reddish tint on the moon! Perhaps I was thinking of the third line of the second verse of *Tears, idle tears*.

In Table 6 I give the apparent positions of various Solar System objects, as seen from Mirzapore (25° 08' 01.3" N, 82° 33' 51.8" E; altitude

Table 6: The positions of various Solar System objects over Mirzapore at 1300hrs UT on 10 October 1858.

Object	RA h m s	Dec(°)	Alt(°)	Az(°)	Up or Set
Donati's Comet	15 07 25	+04 24 44	20.366	265.209	Up
Sun	13 02 23	-06 39 24	-12.580	268.481	Set
Venus	16 02 11	-24 42 54	16.500	231.638	Up
Moon	15 36 12	-24 34 36	11.853	235.398	Up

about 80 m) on 10 October 1858. The choice of time is my own, to try and see how well the placement of the Donati's Comet, and the Sun, Moon and Venus match with the scenario presented by Elsmie (1908).

Tears, idle Tears, mentioned in the indented quotation above, is the famous poem by the British poet Lord Alfred Tennyson (1809–1892). It was written in 1847 and the third line of the second verse is “Sad as the last which redens over one”.

In the same memoirs, Elsmie (1908: 293) also talks about a comet that he saw from Attock on 10 November 1882, while on a journey from Lahore to Peshawur in the Punjab (both are now in Pakistan):



Figure 11: An 1855 photograph of Sir William H. Russell, *The Times* special correspondent (courtesy: Library of Congress <https://www.loc.gov/pictures/item/2001697687/>).

D. November 10. – Reached Attock by rail at 3.30 A.M. A good view of the comet, which is still bright....

This was the Great September Comet of 1882, or C/1882 R1 (see Kapoor, 2020), and it would seem that Elsmie had been following it since its heyday.

6.2 Sir William Russell's Account

Sir William H. Russell (1820–1907; Figure 11), was an acclaimed special correspondent with *The Times* newspaper, and was one of the first modern war correspondents who brought the frontline realities to the people. The wars that he covered were all major ones, namely, the Crimean War, the Siege of Sevastopol, the Charge of the Light Brigade, the American Civil War and India's Uprising of 1857–1858. He published memoirs on his coverage of the various wars, and his two-volume work, *My Diary in India*, covers the years 1858–1859 (Russell, 1860).

Sir William (Russell, 1860(2): 209–213) talks about seeing a comet from a camp in the hills of Himachal. At the time he was with the party of Lord William Hay, the then Deputy Commissioner of Shimla. Russell first saw Donati's Comet on 28 September 1858, when they were in the picturesque mountainous princely state of Jubbul (Jubbal) and were striving to reach the source of the River Ghirree (Giri) and scale Cooper's Hill:

The natives were in high delight, as they had had what they considered a short day's work, and would be permitted to have a day's rest tomorrow. In all directions the smoke of their fires rose up through the dense foliage of the trees, and we could hear their songs as they cooked their simple meals of rice, or bathed themselves in the refreshing stream which flowed past our camp. At night, as we sat at dinner in our tent, there arose, right above the black outline of the forest, cast into the shade by the clear moonlight, a bright and wonderful star, which, as it ascended, displayed a tail of a faint rose-coloured hue streaming after it. The natives assembled in great consternation, and gazed upon it with awe and horror; for with them to have the “Doomwallah” is an omen of most evil import, perplexing nations with the fear of change. It was some moments ere we made out that it was indeed a comet; and for hours we watched its fiery seam across the calm blue heavens, standing in the door of our tents, as the patriarchs of old might have gazed on the wandering visitor in times gone by.

Sept. 29th – To-night the comet was more beautiful than before. Our camp-followers and coolies seemed almost inclined to worship it, and the word “Doomwallah” was ringing through their talk all night. This little stream, by which we were encamped, runs out of a rock close at hand, covered over by roots of trees, and is clearer than any water I have seen in India. It is the source of a great mountain river, which

becomes a tremendous torrent a few miles from this place.

The above-mentioned word "Doomwallah" means "the one with a tail". Jubbal (31°.1095 N and 77°.6647 E, at an altitude of about 1901 m) near Rohru, is a small town, about 90 kilometres from the state capital Shimla.

7 NEWSPAPER REPORTS ABOUT DONATI'S COMET

Below we bring together a few communications that appeared in different newspapers in 1858 and were reproduced in *Allen's Indian Mail* for the year 1858 to show how the apparition was seen by commoners in these tumultuous times. These bring to the fore popular accounts of Donati's Comet and apprehension that it was a portent of war, pestilence and famine, etc.

In the *Miscellaneous* section of the 6 November issue of *Allen's Indian Mail* (1858: 887), under BENGAL, there is a communication from Jalpaiguri about the sighting of a comet:

JULPIGOREE:- A comet was seen at this station by some of our Sepoys at 4 P.M. yesterday, the 19th September, described by them as being very red and fiery, and travelling from north to south.

In the 19 November issue of *Allen's Indian Mail* (1858: 930–931), the *Miscellaneous* section under BENGAL carries an account of the orgy of hatred in the ongoing war, but pauses midway through to narrate the apparition of a comet in the sky:

STAR FORT, JHANSI, Oct. 4. – I have seen a comet for the last six nights. It becomes visible a little after dark, and disappears below the horizon about half past seven. The natives have prophesied great things connecting it; that it will be followed by war, famine, and a great many other things, and even some of our men believe in such superstitious nonsense ...

In the 13 November issue of *Allen's Indian Mail* (1858: 906), there is a communication from Calcutta that had originally appeared in the *Calcutta Englishman* dated 08 October, and was reproduced in *The Perth Gazette* (India ..., 1864):

CALCUTTA, Oct. 8. - Among matters of local interest we have but little to notice. The comet has duly made its appearance, and was visible in Calcutta on the 4th to perfection. It is said that the natives view it as a bad omen of their cause, as it is visible in the west, which they interpret as the point wherefrom India is to be ruled.

Elsewhere the *Allen's Indian Mail* (1858: 910) reproduces a communication about the comet from Bombay (Mumbai), the *Miscellaneous* Section. that makes for interesting reading:

THE COMET:- A comet was observed in the western sky soon after sunset last night. We have no recollection of its having been foretold. As seen from Middle Colaba, shortly after 7 o'clock, P.M., it bore a little to the north of N.W., some 12 or 15 degrees above the horizon, the nucleus being about the same apparent size as a star of the first magnitude, and the tail extending about 15 degrees in length, pointing towards the south at an angle of about 30 degrees from the horizon. From Middle Colaba it appeared to set just behind Malabar Point. In India – at least by the natives – such celestial appearances forebode no good to kingdom and empires. What may this comet announce? That the raj of the Company Bahadoor has come to an end? **** We had a more satisfactory view of the comet last night than on the night preceding. As the celestial visitor was on the point of setting at 7' P.M. it bore about W.N.W., and was from 12 to 15 degrees in altitude above the sea horizon. The body of the comet was of the first magnitude, equal to Polaris, and the tail, which curved first upwards, and then horizontally towards the north, displayed a luminous divergence from the body of the comet which might be termed magnificent. There is no doubt that the comet, in consequence of setting so shortly after sunset, was seen to disadvantage as regards its splendour; but notwithstanding the effect of sunset and twilight diminishing its brilliancy, it displayed a luminous tail equal in arc to 13 degrees (*Bombay Gazette, October 1*).

The same issue of the *Allen's Indian Mail* (1858: 944) reproduces a communication about the comet as seen at Agra:

THE COMET AT AGRA. - The natives have now got a new celestial omen – the appearance in broad sunshine, of the moon and Jupiter. These were shining brightly and near each other on Monday, the 11th October, at two o'clock in the afternoon. The comet, which has passed rapidly to the south and east – thereby, of course, rising away from the sun, and appearing higher, and for a longer interval every evening – has been exhibiting a tail traceable upwards of 45 degrees, curved towards the north, and with its best defined edge towards the south. Its distance from the earth is rapidly increasing, and its splendour is fast fading.

That is a case of gross misidentification.

With the New Moon on 7 October, the comet's elongation from the Sun on the 11th was not so large that it could be viewed during the daytime, as described. At around 2 o'clock in the afternoon, the Moon and Venus were up and about four degrees apart, but Jupiter was far away and had set by this time.

Yet another communication in the *Allen's Indian Mail* (1858: 971) originated from Rohilkhand:

Rohilkund, Oct. 25. - The comet, which has for some time past been gracing the heavens, is now about to make its departing bow to the public. From one of the most conspicuous and brilliant objects, it has sunk into comparative insignificance; to the human eye its glories began to fade as it approached Jupiter, and since passing which, in its course southwards, is still more rapidly becoming scarce. Myself and a friend riding out last evening, a little after dusk, thought of the luminary since it did not attract the eye, and it was not till after many a steady and searching look that we discovered it wrapped in obscurity. On its first appearance speculations were rife respecting it; the native mind had it, that the Jharoo Tarra betokens a still greater crisis than the last; the rebel horde in Oude doubtless took it for their forlorn hope; while our public prints gave us to understand that previous experience of the appearance of such celestial bodies teaches that they are portentous of great events; but a great crisis has preceded our present visitant – the direct Government of India too by the Crown was resolved upon, ere it obtruded on our sight, the great event then, of which it is supposed, to be the forerunner is yet to come, let us hope it is restoration of peace and order throughout the land.. – *Delhi Gazette*."

Rohilkhand is the area around Bareilly and Moradabad in Uttar Pradesh, and it too was a hotbed of revolt. The phrase *Jharoo Tarra* means 'broom star'. Perhaps the communicator here meant Venus for Jupiter, since Jupiter was elsewhere in the sky and it was Venus that the comet actually passed within $\sim 2^\circ$ of on 20 October.

The names of the original authors of the above communications were not given.

8 CONCLUDING REMARKS: THE INTERNATIONAL TRANSMISSION OF ASTRONOMICAL INFORMATION DURING THE MID-NINETEENTH CENTURY

Once again, we are confronted with the question of the channels of communication adopted

by some authors cited in this paper. Experienced astronomers—both professional and amateur—tended to send reports of their observations for publication in established forums, such as *Astronomische Nachrichten* or *Monthly Notices of the Royal Astronomical Society*. But for the others, it was the newspapers, or their personal memoirs.

In the nineteenth century, if one wanted to claim priority for the discovery of a new comet the accepted norm was to immediately rush a report that included the comet's precise position to a professional observatory or a distinguished astronomer, preferably in Europe or the USA. Sometimes discoveries made far from Europe or North America were disadvantaged because of the so-called 'tyranny of distance', as stressed by Orchiston (1997). Some Australian, New Zealand and even Indian astronomers who discovered comets in the days before the completion of the international telegraph network, or even later when there were communication breakdowns during major wars, were never formally credited with their discoveries (e.g., see Kapoor, 2013: 858; Kapoor, 2015: 2281; Orchiston et al., 2020). Madras Observatory's T.G. Taylor is a case in point: he turned out to be an independent discoverer of the Great Comet of 1831, C/1831 A1 (Kapoor, 2011).

We need to realize that India faced extraordinary circumstances during the years 1857 and 1858. For observers in India, Donati Comet of 1858 was not a discovery, and they only began making observations of it after it had reached naked eye visibility and begun drawing universal attention. For example, note that Dr Mackay's observations and orbital calculations, professional at that, initially were publicised through their publication in a newspaper, the *Friend of India*.

For those in the Orient, faster channels of communication had yet to emerge. Note that steamships were already operating on several international routes, and going by the fact that in the mid-nineteenth century they could travel between London and Bombay via the Cape in a month (Etemad, 2007: 79) and to Australia/New Zealand in 75–120 days (Rootsroutes, 2020), the choice of how best to communicate cometary observations and orbital elements rested with the astronomer. The opening of the Suez Canal route to navigation in 1869 would shorten the time-lapse further. Communication using the electric telegraph was introduced in India in 1850. In the following year the East India Company began to use it and, within a few years, the telegraph began to con-

nect many far-off places in India. However, telegraph lines from London to India (8300 km) had been laid and connected only by January 1870, first to Calcutta and then to Bombay and Madras (Karbelashvili, 1991). Eventually, it was the Great September Comet of 1882 that prompted the foundation in Kiel, Germany of the *Central Bureau for Astronomical Telegrams* (CBAT) in late 1882 by the editors of *Astronomische Nachrichten* when a need for a coordinated centre was felt for a fast and proper dissemination of information.

9 NOTES

1. "Comet Tales from India" is my ongoing project since 2009 in the search for records of cometary sightings made from the Indian region, from antiquity until 1960, where available data, however minimal, permit identification of the comet. The paper "Comet Tales from India. 1. Ancient to Medieval" (Kapoor, 2018a) covers the period up to 1799. The search for observations of comets made in India in the nineteenth and twentieth centuries is in progress. Nineteenth century comets that have been dealt with in this series are the Great Comet of 1831 (Kapoor, 2011), the bright comet of 1825 IV (Kapoor, 2016), Donati's Comet as described by Mirza Ghalib (Kapoor, 2018b), the Great Comet of 1807 (Kapoor, 2019a), the Great Comet of 1811 (Kapoor, 2019b) and the Great September Comet of 1882 (Kapoor, 2020).
2. J.B.N. Hennessey (1829–1910), also from The Great Trigonometrical Survey of India, had observed the 1874 transit of Venus from Mussoorie. Mary Villa, the site of his appropriately named 'Venus Station', was

6765 feet above sea-level at 30° 27' 36.3" N and 78° 3' 3.2" E (Kapoor 2014: 119).

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