French astronomers in India during the 17th–19th centuries

R. K. Kochhar

The contributions made by French astronomers from India are reviewed. The French were more successful on the scientific front than on the colonial. The first telescopic discovery from India was made by a French Jesuit priest, Father Jean Richaud (1689). Surprisingly, the first ever modern worthwhile map of India was prepared in France by D'Anville (1752). All Indian maps till 1905 used the value of Madras longitude derived by a Frenchman, John Warren (1807). And finally, the first ever discovery from India – and of singular importance – in the then new field of astrophysics, was also due to a visiting Frenchman, Janssen (1868).

Introduction

The 1498 discovery by Vasco da Gama of a direct sea route to India opened up the subcontinent to the Europeans.[1] The Portuguese were followed by the British, the Dutch, and finally the French. Echoing the unanimous desire of the French merchants and mariners, Jean-Baptiste Colbert set up in 1664 the Compagnie des Indes Orientales for trading with India. In 1674 François Martin founded the city of Pondicherry on the east coast of India which became the headquarters of French presence in India. In tow with the Europeans came moden science.

The first modern men of science in India were the Jesuit priests, who acquired their foothold in 1542.[2] In keeping with the requirement of the times, they aimed at geographical knowledge, often took astronomical observations of latitude and longitude, and compiled sketches and maps.

Selected letters from Jesuit missionaries in all parts of the world were published in 34 volumes from Paris between 1702 and 1741. An abridged edition was brought out in 1780–3 by Querboeuf in 26 volumes, of which volumes X to XV refer to India. These volumes were constantly referred to by later geographers.[2]

The French Jesuit priests arrived in India under rather trying circumstances, from the east rather than the west.[3,4] In 1687, King Louis XIV had sent, on an invitation from the King of Siam (Thailand), a team of 14 Jesuits, formally designating them 'The Mathematicians of the King'. The Jesuits arrived in Siam in 1688 but could not stay very long. In 1688 itself there was a revolution that overthrew the King of Siam and expelled the missionaries, who then left for India. Only three were able to survive the ordeal, and reached Pondicherry on 17 February 1689.[3,4] Two of them were Father Richaud and Father Bouchet, who made their mark in pure astronomy and geography respectively. It is not clear who the third Jesuit was.

Father Jean Richaud SJ (1633–1690)

Jean Richaud[3] was born on 1 October 1633 at Bordeaux, France. He entered the Society of Jesus at the age of 15, and took his vows two years later. He taught mathematics at the Royal College at Pau between 1668 and 1686. Richaud was a keen astronomer. He observed a solar eclipse on 12 July 1684 and a comet during 7–15 September 1686.

Arriving in Siam in 1688, Richaud set up an observatory at Luovo with his 12-ft focus telescope. He also prepared a calender for the Kingdom of Siam, which he presented to the King.[5]

Once in India, Richaud lost no time in getting down to astronomical observations. He observed for the longitude and latitude of Pondicherry and the latitude of San Thome (or Mylapur) in Madras, where St. Thomas had stayed and died. Richaud also made observations of zodiacal light. He observed a comet in December 1689.[3,4]

Richaud's most significant contribution was made while viewing the comet. He discovered that the bright southern star Alpha Centauri is in fact a double star.[3,4] This was the second binary to be spotted. Earlier, in 1685 another Jesuit, Father Fontenay, had discovered from the Cape of Good Hope the first binary, Alpha Crucis.

Richaud's discovery is the first ever modern astronomical discovery from India. Indeed it is the first ever *recorded* astronomical discovery from India. (It should however be mentioned that Richaud's is not the first recorded use of telescope from India. An Englishman, Jeremiah Shakerley (1626–*ca.* 1655) used a telescope at Surat in 1851 to observe the transit of Mercury, and in 1652 a comet.[5])

Father Richaud taught astronomy at a school opened by the Jesuits at San Thome. He died at Pondicherry on 2 April 1693.

Carte de l'Inde

Interestingly, although the French were thwarted by the British in their attempts for supremacy in India, the first worthwhile maps of India were the result of the French efforts.

Accompanying Father Richaud from Siam was Father Jean-Vevant Bouchet SJ (1655–1732) who was born on 10 April 1655 at Fontenny-le-Comte, France,

and was admitted to the Society of Jesus on 7 October 1670.[2]

On reaching India in 1689, Bouchet entered the Madurai mission which he left in 1702 to found Carnatic mission. Bouchet covered the Coromandel coast on foot, made astronomical observations at Pondicherry and other places, and prepared maps and sketches. He sent his account to France in 1719. From these Jean-Baptiste Bourguignon D'Anville (1697–1782) prepared in 1737 his first map of the south Indian peninsula.[2]

Bouchet's astronomical work is partly described in *Memoirs de l'Academie des Sciences*, volume VI and other writings are preserved in the library of the school of St Genevieve, Paris.

Another French Jesuit who made significant contributions to Indian geography was Father Claude Stanislaus Boudier SJ (1686–1757). Born on 16 October 1686 in the diocese of Sens in France, he left for Bengal in 1718 and after arriving at Chandernagore in 1719 established himself as an astronomer. In 1734, on the request of Raja Jai Singh, he visited Jaipur along with a companion, making a journey of more than 1500 km. He returned after about a year. Boudier made frequent observations for latitude and longitude and also surveyed a part of the route he traversed. His memoir on the journey gives the description of places on the road from Agra to Allahabad, mentioning distances from the rivers Ganga and Yamuna.

A forgotten name in Indian surveying annals is that of the French navigator Jean-Baptiste Apres de Mannevillette (1707–80) who was born at Harve de Grace. He made a number of voyages and published in November 1745 the *Neptune Orientalis*, an atlas of marine geography. He used a Hadley's quadrant as early as 1736, when it was definitely regarded as an English instrument.[2]

On an invitation from the French East Indian Company, D'Anville prepared in 1752 his Carte de l'Inde.[2] It was the first ever map of the country based on well-attested observations and surveys rather than traveller's tales. D'Anville was the first geographer who preferred to leave his map blank rather than insert details for which he had no good authority. His map was accompanied by an account of all the works he had consulted. His most valuable material included astronomical observations by various Jesuit missionaries, like Bouchet and Boudier. His map and memoir were published in England in 1754 and again in 1759.

Guillaume Le Gentil de La Galaisiere (1725–92)

Le Gentil probably ranks as the unluckiest astronomer of all time. He was an assistant to Giovanni Domenico Cassini (1625–1712) the director of the Paris Observatory, and was deputed, on the recommendation of the Royal Academy of Sciences, by the King of France to observe the 6 June 1761 transit of Venus across the disc of the Sun.[7] The transit had aroused great interest and a large number of French and English astronomers journeyed to far-off and little known places. In 1761 the phenomenon was visible in its entirety from Asia (and north polar regions), while in the western Europe and the Atlantic only the end could be seen.

When Le Gentil set out for India, the seven year war (1756–63) was raging between England and France, and Le Gentil's ship had to make wide detours to avoid an English attack.[7] By the time he reached Pondicherry, the transit was already over. He decided to remain for the transit of 3 June 1769. He could not observe this transit either, because the skies were cloudy. On his way back home he was ship wrecked twice, and eventually when he reached France after an absence of 11 years, he found that he had been declared legally dead and his property distributed among the next of kin.[8,9]

During his stay at Pondicherry he determined its longitude by a series of observations, and kept himself busy with magnetic and other scientific work at Pondicherry and over the Indian ocean, an account of which he later published as *Voyage dans les Mers de l'Inde*, Paris 1779.[2]

The two transits aroused a feeling of competition among the traditional rivals France and England.

The Royal Society of London sought the help of the East India Company for the 1769 transit, its secretary writing[10] on 22 January 1768, 'The honour of this Nation seems particularly concerned in not yielding the palm to their Neighbours, and the Royal Society intends to exert all its strength and influence in order to have this observation made . . .'

As it turned out, both the English and the French palms were left high and dry because of the cloudy skies over the neighbouring Madras and Pondicherry.

Most Frenchmen who worked in India were associated with the French territory. An important surveyor-mathematician who was a part of the British establishment was Capt. John Warren.

Capt. Jean-Baptiste François Joseph de Warren (1769–1830)

Known simply as John Warren, he was a direct descendant of Guillaume de Warren, first count of Warren and Surrey who had accompanied William the Conqueror to England in 1066 and married his youngest daughter Gondrada. The younger branch of the family settled in Ireland with the title Count of Warren. On the accession of William III in 1688, Edward Warren was banished and his estates were confiscated for having supported the Catholic James II. Edward settled in Lorraine.[2]

John Warren was born on 21 September 1769 at Leghorn, Italy, the fourth child of Count Henry Hyacinthe de Warren and his wife Christine Walburge de Meuerers.

John Warren joined the army but left the country in 1791 after the revolution, and in January 1793 came to London, penniless. He tried to earn his living as an

artist, who could draw and etch. He failed. Using his family connections and armed with letters of introduction to indigo-planters he arrived at Calcutta on 10 December 1793. After a four-year rather unsuccessful stint as an indigo-planter, he bought a commission as ensign (the lowest commissioned rank = 2nd lieutenant) in the army and participated in the war against Tipu Sultan of Mysore under the command of Arthur Wellesley, the future Duke of Wellington,[2] with whom he struck a warm and personal friendship.

In view of his 'addiction to mathematical studies', John Warren was appointed in December 1799 to assist in the Mysore survey, and when in 1800 trigonometrical survey of the southern peninsula began, Warren was involved in it.

Warren was the first European to notice in 1801 the existence of gold in workable quantities in the Kolar area near Bangalore. He also suggested that there should be milestones on highways. Going ahead, he placed – at his own expense of two rupees per milestone – 262 milestones between Serigangapatnam and a place spelt Naickenchero, and on the lower road between Bangalore and Balamangalam.[2]

During February 1805 – October 1811 he was the acting director of Madras Observatory, when John Goldingham was on leave.[2] (The Company would not spare its officers for permanent civilian duty).

Besides holding the post of Company Astronomer, Warren[2] also held (till 1810), like his predecessor, the additional posts of Marine Surveyor, Superintendent of the Surveying School, and Inspector of Revenue Surveys. In 1807 he served as the ADC to the acting governor, William Petrie. Warren also held at various times till 1813 the military posts of Brigade Major, extra ADC to the commander-in-chief and deputy quartermaster general.

Warren was one of the rare Company officers who were asked to return the money they had embezzled. The superintendent of the surveying school used to draw 100 pagodas per annum for each of the pupils for meeting contingent expenses. By the custom of the times, Warren drew 1200 pagodas a year irrespective of the number of students at the school. Following a complaint by an ex-pupil, Warren was brought to book on this count and made to refund the excess amount of 3860 pagodas (about Rs.13 500).

His most notable work at the observatory was the determination in 1807 of value of the longitude of Madras, which was retained in official maps for almost hundred years until 1905. He wrote papers on the effects of terrestrial refraction, on the length of the simple pendulum and on the ellipticity of the Earth. He also published an account of the ancient city of Bijapur, which he had visited in 1813 (*Asiatic Journal*, January 1821, p. 47), as part of campaign against the Marathas.

After receiving in September 1814 the news of the restoration of the monarchy in France, accompanied by his eldest son Edouard, he reached France in October 1815 and was reinstated in the French army with the brevet rank of Lieutenant Colonel and admitted

Figure 1. Jean-Baptiste Francois de Warren (1769–1830). Portrait as a boy. Family collection. (Reproduced from ref. 2)

Chevalier of St Louis. In April 1816, on the death of his eldest brother, he became the 24th Comte de Warren.

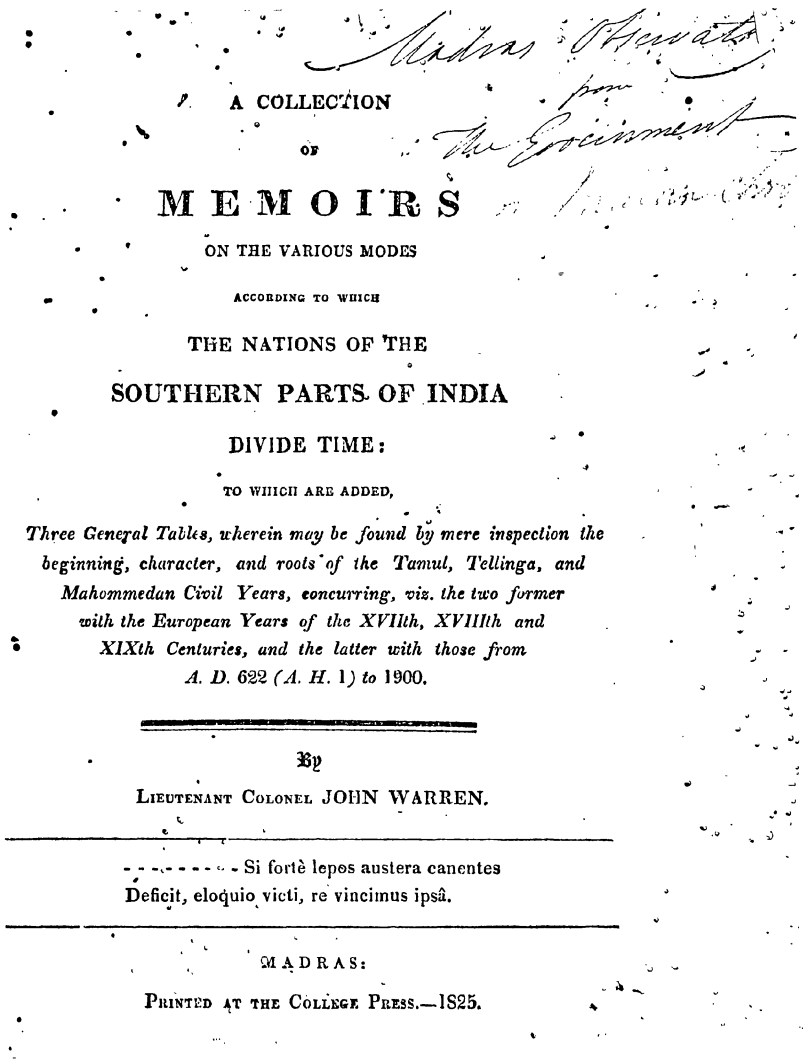
In Paris he met many men of science, including Laplace, and, after Waterloo, his old friend the Duke of Wellington. While in France, he was elected a corresponding member of 'le Bureau des Longitudes'. Leaving his son behind to be educated at Nançay, Warren returned to India, quit the army, and settled in Pondicherry.

In 1814 Warren started work on the south Indian methods of timekeeping 'at the call of private friendship'.

Warren's research was brought by the Board of Superintendence of the College of Fort St George to the notice of the Government, which in 1815 purchased the manuscript as it then stood. The work, it was felt, would make Indian calendars intelligible to the Europeans, facilitate a comparison of the European and Indian chronologies and thus be 'of service to gentlemen employed in the Revenue and Judicial departments'.

This authoritative work was finally published in 1825 having continued for 11 years because of 'the various employments which he held in His Majesty's Civil and Military Service in different parts of the world'.

Warren wrote in the Preface[11] 'The present production ... will at least serve to show nearly the present extent of our knowledge in Hindu astronomy in these



A COLLECTION

OF

MEMOIRS

ON THE VARIOUS MODES

ACCORDING TO WHICH

THE NATIONS OF THE

SOUTHERN PARTS OF INDIA

DIVIDE TIME:

TO WHICH ARE ADDED,

Three General Tables, wherein may be found by mere inspection the beginning, character, and roots of the Tamul, Tellinga, and Mahommedan Civil Years, concurring, viz. the two former with the European Years of the XVIIth, XVIIIth and XIXth Centuries, and the latter with those from A. D. 622 (A. H. 1) to 1900.

By

LIEUTENANT COLONEL JOHN WARREN.

- - - - - - - - Si fortè lepos austera canentes
Deficit, eloquio victi, re vincimus ipsâ.

MADRAS:

PRINTED AT THE COLLEGE PRESS.—1825.

Figure 2. John Warren's Kala Sankalita 1825.

southern provinces, and ... the author may perhaps be suffered to claim some credit for having been the first in Carnatic, since the days of Beschi and Le Gentil, who unassisted has endeavoured to draw the public attention on a subject of this nature'.

When Warren had started on the project it was his desire 'to familiarize the learned Natives with the use of Tables constructed and disposed in the manner of those of the European Mathematicians, also to reconcile them to the idea of brevity and expedition in computations ...' In this Warren 'found himself more successful than he had a right to accept'. As he noted, with pride and satisfaction 'His Tables ... after the due examination by the best informed Jyautish Sastras [should be Sastris] have been pronounced equivalent to the respective rules which they were intended to abridge and they [scholars] have manifested an intention of using them in future'.

The whole work[1] – consisting of four Memoirs, four Appendices, four Fragments, and 52 Tables (three compiled, the rest computed) – 'collectively taken was denominated by some learned friends *Kala Sankalita*, Sungscrete word signifying the doctrine of times. It presents (as far as the author knows) the first attempt that was made in India to investigate and explain the elements of Hindu Astronomical Chronology, and to disclose to Europeans the contents and structure of these humble annual Kalendars which, written on palmyra leaves, had for nearly two centuries, been sold under their eyes without their even suspecting the skill and labour which their computation required'.

In the meantime, in 1821, he took up the study of French law, and was appointed councillor at the Court of Justice (September 1815) and advanced to Judge of the Chief Court (August 1828–April 1829). In August 1824 he was appointed Chevalier of the Legion of Honour, and decorated in 1829.[2]

He was so popular that when his second daughter got married in 1829, the Hindus wanted to pay the expenses of the festivities. Jean-Baptiste de Warren died at Pondicherry on 9 February 1830. His son Edouard de Warren published in 1844 a book *L'Inde Anglaise en 1843* on the services of his father with the British.[2]

By a remarkable coincidence just as the first telescopic discovery in India was made by a Frenchman, 200 years later it was again a visiting Frenchman

who made the first discovery in the new field of astrophysics.

Pierre Jules César Janssen (1824–1907)

Janssen[12] was born in Paris on 22 February 1824. His maternal grandfather was the architect Paul-Fuillaume Le Moyne. An accident in early childhood left him permanently lame. He was thus kept at home and never attended school. Janssen attended the University of Paris, receiving his licence es sciences in 1852. In 1857 he became a tutor for the Schneider family, which owned iron and steel mills in Le Cruesot.

Janssen's first scientific work was a study of the absorption of radiant heat in the medium of the eye. It earned him a doctorate of science in 1860.

At that time, astronomy was beginning to be merged with physics. In October 1859, the theoretical work of Gustav Kirchhoff (1824–87) solved the engima of the spectrum and it became possible to establish the chemical composition of the Sun and the stars. The physicists and astronomers then awaited a total solar eclipse to learn about solar prominences.

The eclipse of 18 August 1868, visible from India, the Malayan peninsula and Thailand, attracted a large number of astronomers. Janssen with his spectroscope was stationed at Guntoor (in Andhra Pradesh) near the Bay of Bengal.[13]

All the observers on the morning of 18 August 1868 found out that the prominences were made of highly-heated masses of gas, mostly hydrogen. But Janssen went further.[12] The emission lines he saw during the eclipse were so brilliant that he felt certain that he did not have to wait for the darkness of the eclipse to see them. He was prevented by clouds from trying the experiment the same afternoon after the eclipse was over. But the next morning, he directed the slit of his spectroscope to the portion of the sun's limb where the day before the most brilliant prominences had appeared. He had no difficulty in spotting the emission lines again, this time in full daylight.

Janssen made a significant discovery. The yellow line which everybody had mistakenly thought to be that of sodium had to belong to some other element. Edward Frankland named this new element helium. It was discovered on the Earth in 1895, by William Ramsay.

From 18 August to 4 September 'during a period equivalent to an eclipse of 17 days', Janssen worked at Guntoor, and then continued his observations at Simla in the Himalayas, where he created the first-ever spectrohelioscope.[12] This discovery made it possible to observe the Sun's chromosphere every day. (Janssen's elementary spectrohelioscope was superseded by George Ellery Hale's (1868–1938) invention of spectroheliograph in 1889.)

Unknown to Janssen, Joseph Norman Lockyer (1836–1920) succeeded on October 1868 in observing solar prominences without an eclipse. By a strange coincidence, Janssen's report from India and Lockyer's from England were received at the French Academy on the same day and the event was commemorated by the French government in 1872 with the issue of a gold medal bearing the likeness of both Lockyer and Janssen.[14]

In 1876, Janssen became the founder-director of the Meudon Observatory, where he continued till his death on 23 December 1907.

Janssen was the last Frenchman in India to contribute to the astronomical sciences It may not however be out of place to mention a couple of instruments that came from Paris.

French astronomical instruments in India

A six-inch apeture telescope on an English mount was made by M. Secretan of Lerebours & Secretan of Paris on an order from Capt. William Stephen Jacob (1813–62), who was then at Poona.[15–17] The telescope was inspected by Jacob's friend Charles Piazzi Smyth in 1849 at Paris, who made a painting of it that can be seen at Royal Observatory, Edinburgh.

Jacob was in the meantime appointed the director of Madras Observatory, where the telescope arrived in 1850. The East India Company subsequently payed its cost (£500) to Jacob and bought the telescope.[18]

The telescope had a defective object glass, which was replaced by the maker in 1852. Jacob used this telescope to study the brighter satellites of Saturn. He showed in August 1852 that the crepe (or C) ring discovered two years earlier was translucent so that one could see the globe of Saturn through it 'as through a film of smoke'.[18] The same phenomenon was independently noted in late October 1852 by William Lassell (1799–1880) at Malta through his 20-inch aperture reflecting telescope.[19]

The revelation of the semi-transparent crepe ring convinced astronomers that the whole question of ring structure needed a thorough re-examination, and led to the influential 1857 work of James Clerk Maxwell, who showed that the rings were made of a large number of particles.

Using the Secretan telescope, Norman Robert Pogson discovered an asteroid on 17 April 1861. It was the

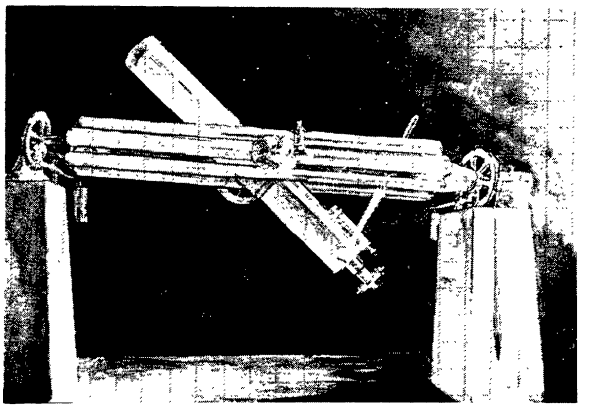


Figure 3. 6-inch aperture telescope by Lerebours & Secretan of Paris 1849, painted by Charles Piazzi Smyth. *(Courtesy Royal Observatory Edinburgh)*

first ever discovery from India of a minor planet, which was aptly named Asia.[16]

This telescope, along with an 8-inch equatorial by Troughton & Simms (1866), was the mainstay of the Madras Observatory.

The 6-inch telescope was remodelled in 1898 by Sir Howard Grubb of Dublin, who provided it with an electric drive, and mounted an extra 5-inch aperture Grubb photographic lens on the equatorial. The remodelled telescope was installed at the Kodaikanal Observatory (established 1899). In 1912 John Evershed replaced the object glass with a photovisual lens, which in turn was replaced in 1918 by a visual achromatic lens. Since 1912 the telescope has been in regular use for direct daily photography of the sun. It is thus the oldest telescope in India – one of the oldest in the world – still in use.[16,17]

A minor instrument received from France is a drum chronograph with electrical arrangement made by Eichens & Hardy of Paris, Hardy having been in charge of the electrical part. This chronograph came to Madras with a history behind it.[17,20]

Two identical Cooke transit telescopes (marked 1 and 2) and two chronographs (A and B) were made in 1872 under the supervision of Col. A. Strange for the Great Trignometrical Survey of India. In 1872 itself these two sets of instruments (along with clocks by Frodsham) were used for the fist telegraphic determination of longitude difference. The stations chosen were Bangalore and Madras and the observers were Maj. John Herschel and Maj. W. M. Cambell, both of Royal Engineers. (Regular work, however, started in 1875.) In 1896, the telescope 2 and the chronograph A were sent to Madras for the proposed Kodaikanal Observatory. The drum chronograph is now without the electrical apparatus, and displayed at Bangalore. (The Cooke telescope, minus the optics, continues to be at its original site at Kodaikanal.)

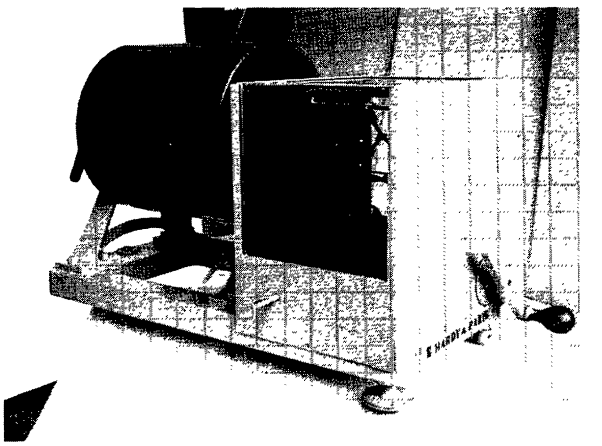


Figure 4. A recent photograph of the now damaged drum chronograph by Eichens & Hardy of Paris 1872.

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Address: Indian Institute of Astrophysics, Koramangala, Bangalore 560034, India

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Madras Observatory had two teams, one at Masulipatam (now in Andhra Pradesh) led by the Astronomer Norman Robert Pogson and the other at a small village Vunpurthy (in Andhra Pradesh) under the first assistant C. Ragoonathachary.
There was a Prussian team at Moolwar near Bijapur. (The other team of Dr Vogel was at Aden).
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