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THE DELHI OBSERVATORY OF SAWAI JAI SINGH II (1688 CE TO 1743 CE)

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Abstract: India has a long tradition of observational science. Sawai Jai Singh II played an important role in the glorious journey of Indian astronomy. In this paper, I am going to discuss the Sawai Jaisingh II and his delhi observatory in India.

Keywords: Maragha Observatory, Samarkand Observatory, Sawai Jai Singh II, A brief history of construction of Delhi Observatory, Astronomical instruments of Delhi Observatory, Tieffenthaler, W. Franklin, William Hunter, Willium Thorn, Thomas & William Daniell, Leopold Van Orlich, Garcin De Tassy, Carr Stephen, H.C. Fanshawe, The Associates of Sawai Jai Singh II,

Introduction:

Sawai Jai Singh II played an important role in the glorious journey of Indian astronomy. He was the only person of the whole world who built five astronomical observatories in India through his personal efforts.

The five astronomical observatories of Sawai Jai Singh II are –

1. Delhi observatory (1724 CE)
2. Jaipur observatory (1728 CE)
3. Ujjain observatory (1734 CE)
4. Varanasi observatory (1737 CE)
5. Mathura observatory (1738 CE)

The above observatories have various types of astronomical instruments. These instruments are played an important role in the astronomical observations of Indian astronomy.

Astronomy is an observational science. The positions and movements of heavenly bodies have to be observed and recorded very accurately before a

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theory to explain. The astronomical observations are not very accurate without instruments. Therefore, instruments and observatories are one of the most important tools of astronomical studies.

The word 'observatory' derived from the 'Jantra-Mantra' in Sanskrit Language. 'Jantar' means instrument and 'Mantar' means mysterious calculation. Therefore, observatory (Jantar-Mantar) means the strange calculations with the help of instruments. The Jantar-Mantar or observatory is known as Jantra –Śhala or vedha shala or Jantralaya or yantra Mahal etc.

Sawai Jai Singh II was born on 3rd November 1688 CE at Amber in Rajasthan, India. His father Raja Bişnu Singh or Bişānsingh was the rular of Amber. His grandfather was Mirza Jai Singh and they belong to kaccawa or kushwaha dynasty. The 'Sawai' was a title of honour given by Mughal emperor Aurangazeb to Jai Singh II. The 'Sawai' literally means a quarter over one in strength and intelligence. In other words it means one and a quarter of an average man in the worth.

The Mughal emperor Aurangazeb was impressed by the wit and chivalry of Maharaja Jai Singh II. Unexpectedly died on 1699 CE. At the age of 11 Jai Singh II was crowned as the Raja of Ambor on 25th January 1700 CE. [Ref.2]

The legendary person Sawai Jai Singh II died on 21st September, 1734 CE at Jaipur. A glorious period of Indian astronomy was ends to his death. According to his work he became an immortal person in Indian and world also. He was one of the most important pathfinder of Indian astronomical observatories or Indian astronomy. [Ref.3]

Sawai Jay Singh II as a person I have discussed in a separate chapter of my thesis on "Indian astronomical instruments of Sawai Jai Singh II" in details.

Here I am going to discuss the work of Sawai Jai Singh II on astronomical observatories in details.

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Sawai Jai Singh II have vast knowledge on astronomy. He recognized that without astronomical instruments the astronomical observations are incomplete. Sawai Jai Singh II noted that the instruments give accurate time if they are fixed. The small and handy instruments give the uncertain or problematic issue in astronomical observation. He needs the fixed and installed instruments and accurate astronomical tables which are very important to the study of astronomy or astronomical observations. To get more accurate results Sawai Jai Singh II was decided that he constructed big masonary instruments which could be best set once for all and being stable were not liable to change their azimuth. The great astronomer and ruler of Samarkand Mirza Ulugh Beg was accepted this theory in the previous time of Sawai Jai Singh II. [Ref. 4]

Sawai Jai Singh II decided to build the astronomical observatory in India. He was inspired for this work by Ulugh Beg's Samarkand observatory in central Asia.

Ulugh Beg (1394-1449 CE) was a famous astronomer and Turk monark in central Asia. His father was Shah Rokh and grandfather was the famous conquror Timur the Lame. Ulugh Beg Bwas very much inspired by maragha observatory.

The Maragha observatory was one of the biggest observatory in the Muslin world it was constructed at the time of Sultan Bulagu ((or Hulagu) at Maragha in 1259 CE. Modern Maragha (Tabriz) is situated in Iran. [Ref.5]

Ulugh Beg visited Maragha observatory during a military expeditions of his grandfather Timur Lane. Ulug Beg was much inspired by the pottern of stone and masonary instruments of Maragha observatory.

The Mirza Ulugh Beg constructed a magnificent observatory in his capital Samarkand in around 1425 CE. The Samarkand is now in Uzhbekistan. He bulid several stone and masonary instruments. A meridian

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Are of 40 meter radius which was the world's largest astronomical structure of that was manufacture by Ulugh Beg. [Ref. 6]

Therefore, Sawai Jai Singh II was inspired by both Maragha and Samarkand technique of astronomical construction in stone and masonary which was reflected most of his astronomical devices.

Sawai Jai Singh II send his envoy in central Asia to collect informations and charts about Ulugh Beg's observatory at Samarkand. [Ref.7]

Sawai Jai Singh II build five astronomical observatories all over the India. They are as follows:

1. Delhi observatory. (1724 CE).
2. Jaipur observatory. (1728 CE).
3. Ujjain observatory (1734 CE).
4. Varanasi observatory (1737 CE).
5. Mathura observatory (1738 CE).

Now I am going to discuss in details about the above observatories.

Delhi observatory (1724 CE)

Delhi observatory was the first astronomical observatory of Sawai Jai Singh II.

• **The parameter of Delhi observatory:**

Here I mention a few parameters of Delhi observatory at a glance.

Altitude: 239 Metrs (785 Ft.) above M.S.L.

Latitude: $28^0 39^/$ Narth.

Longitude: $77^0 3^/ 5^{//}$ East of Greenwich. [Ref.8.]

Hight above sea lavel: 220m.

Local Time: Indian Standard Time:

21 minutes, 8 second;

Universal Time: + 5 hours, 8 minutes, 52 second. [Ref.9].

• Local: The Delhi observatory is located in the area of Lok-Sabha (The National Parliament of India).

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• **Abrief Historyt of construction of Delhi observatory:**

The history of the construction of Delhi observatory was quite interesting. From the ealier times, the Amber ruler and the Mughal Emperos were become quite close to each other. In the 16th century CE, the Bhagwan Das of Amder's period it begins. The later rulers of Amber are follows more or less in this policy.

The Maharaja Sawai Jai Singh II of Amber continued this policy and promised to her support to Mughal emperors. His contemporaries (or coevals?) Mughal emperors arew like, Aurangzeb, Bahadur Shah, Jahandar Shah, Farrukh Siyar and Muhammad Shah.

He frequently came to Delhi for various purpose. Sawai Jai Singh II build his first astronomical observatory in Delhi with the consent of Mughal emperor Muhammad Shah. Muhammad Shah emerged as the monarch of Mughal dynasty in 1720 CE. Sawai Jai Singh II was invited by Muhammad Shah in a meeting which was held in November 1720 CE. Some important dicisions such as construction of the observatoetc were made in the meeting may be accepted in this meeting. According to the Zij-i-Muhammad Shāh, the Delhi observatory was build during the reign of Mughal emperor Muhammad Shah. Therefore, the Construction of Delhi observatory may be started in 1721 CE perhaps the observatory was completed in 1724 CE.

A number of foreign visitors mentioned that the Delhi observatory was built in 1724 CE.

Therefore, the most accepted date of construction of Delhi observatory in was1724 CE. [Ref. 11]

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The astronomical instruments of Delhi observatory.

Here I am going to discuss the astronomical instruments of Delhi observatory in a nutshell.

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Sawai Jai singh II initially used metallic instruments in Delhi observatory then it was replaced by masonry instruments. There are seven astronomical instruments in the Delhi observatory according to the opinions of Samrāt Jagannāth and the visitors. The seven astronomical instruments are as follows:

1. Samrāt yantra (Equatorial sundial instrument).
2. Jaya Prakāśa Yantra (Armillary sphere instrumenmt).
3. Rāma Yantra (Altitude / Azimuth instrument).
4. Ṣaṣṭhāṁśa Yantra (Sextant instrument).
5. dakṣinotara Bhitti (The meridian wall instrument).
6. Miśra Yantra (Composite / Mixed instrument).
7. Agrā Yantra (Horizontal Sundial instrument).

It is to be noted that at present there are six astronomical instruments in Delhi observatory. They are given below:

1. Samrāṭ Yantra or Bṛhat Samrāṭ yantra (Large Equatorial sundial instrument).
2. Jaya Prakāśa yantra (Armillary sphere instrument).
3. Rāma yantra (Altitude / Azimuth instrument).
4. Ṣaṣṭhaṁśa yantra (sextant instrument).
5. Agrā yantra / Dhoop-ghari (Horizontal Sundial instrument).
6. Miśra yantra (Composite / Mixed instrument).

In 2.3 of chapter 2 I discuss the astronomical instruments of Sawai Jai Singh II in details.

• Accounts of the renowned foreign visitor's of Delhi observatory:

Delhi was the imperial capital and the most important city of Indial. Here many travelers visited frequently. Some of them have left valuable accounts of Delhi observatory. They are as follows: Tieffenthaler, W. Frenklin, William Hunter, William Thorn, Fanny Parks, Thomas and William Daniell, Leopold Vor orlich, Garcin de Tassy, Carr Stephen, H.C. Fanshawe etc.

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Here I discuss a few renowned visitors and their account on Delhi observatory, Viz.

• **Tieffenthaler:**

Tieffenthaler came to India as a Jesuit missionary in 1743 CE. He visited the Delhi observatory in 1747 CE. He visite the Delhi observatory in 1747 CE. He gives a brief account of Delhi observatory and describes the astronomical instruments of this observatory.

Tieffenthaler describes the astronomical instruments like Samrāṭ yanra, Rāma yantra and other functional works of Delhi observatory.

w. Franlin:

W.Franklin visited Delhi observatory in 1793 CE. He gives a brief account of Delhi observatory. He wrote an article on "An Account of the present state of Delhi" and published in the Asiatic Researches. It is a remarkable work on Delhi observatory.

William Hunter:

William Hunter completed a detail study on Delhi observatory in 1790 CE and it was published in 1799 CE as a report in the Asiatic Researches of Calcutta. William Hunter described the measurements of the instruments of Delhi observatory, Viz. Samrāṭ yantra, Miśra, yantra, Dakṣinottara Bhitti yantra, Rāma yantra, Jaya Prakāśa Yantra etc.

William Thorn:

Major William Thorn visited Delhi observatory probably in the month of September, 1803 CE. He mentioned the Delhi observatory as 'Gentur Muntur'. The establishment year of Delhi observatory was described as third year of the reign of Muhammad Shah or 1724 CE by Jeysingh or Jayasingh.

The Jayasingha or Sawai Jai Singh II was the founder of Jeypoor or Jaipur city. William Thorn gave a descriptions of Delhi observatory ad along with instrument.

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He mentioned the mentioned the 'zij-i-Muhammad Shahi', which was an astronomical tables prepared by Sawai Jai Singh II in 1728 CE.

• **Fanny Parks:**

Fanny Parks visited Delhi observatory in the early 19th century.

• **Thomas and William Daniell:**

Thomas and William Daniell published two engravings of Delhi observatory in their book "orientqal Scenery" in 1816 CE.

Leopold Van Orlich:

Leopold Von Orlich wrote on Delhi observatory sometime before of 1845 CE. He describe that Delhi observatory was build by Sawai Jai Singh II (Jeysingh, Rajah of Jeypoor) under the permission of Muhammad Shah in 1724 CE.

Garcin de Tassy:

Garcin de Tassy published his account on Delhi observatory in the Journal Asiatique in 1860 CE. It was based on the article of Sayyid Ahmad Khan, who was an inhabitants of Delhi. Sayyid Ahmad Khan was the founder of Aligarh Muslim University.

Garcin de Tassy described as the Delhi observatory was build by Sawai Jai Singh II with the permission of Mughal emperor Muhammad Shah in 1724 CE.

Carr Stephen:

Carr Stephen wrote a book based on the archaeology and monuments of Delhi in 1876. Here he included a vivid description of Delhi observatory.

H.C. Fanshawe:

H.C. Fanshawe published an account of Delhi in 1902 CE. In this account he gave some new informations and description of Delhi, which was meaning full and significant knowledge of Delhi observatory.

The Assoiciates of Sawai Jai Singh II:

A few renowned associates of Sawai Jai Singh II played an important role in the construction of Delhi observatory. The count astronomers and architects

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of Sawai Jai Singh II were associated with the construction of Delhi observatory. Among them the notable persons were pandit Vidyadhar, Pandit Jagannath Samrate, Pandit kewal Rama Sharma, Nayanasukhe Upadhyaya, Hari Lala Miśra etc.

Some European and Muslim astronomers were also associates of Sawai Jai Singh II and his works.

Restoration:

Sawai Madho Singh II played an important role in the restoration of Delhi observatory. Sawai Madho Singh II was the admirable son of Sawai Jai Singh II. He took some initial dicisions to restoration the instruments and observatories of Sawai Jai Singh II.

Pandit Gokul Chandra Bhavan took the responsibility of this restoration. He accomplished this work very fruitfully in 1910 – 1912 CE. Pandit Gokul Chandra Bhavan was the count astronomer of Sawai Madho Singh II.

Pandit Kedar Nat5h Sharma also played an important role in the restoration of the composite instrument (Miśra yantra) of Delhi observatory in marble.

Sawai Madho Singh II and his associates decided to convert these instruments (means the instruments of Delhi observatory) into marble and sand stone for effective and eternal purposed. It is the useful idea for Delhi observatory. Now, it is preserved under the Archaeological survey of India ASI, which is under control of Archaeology Department of India.

Conclusion:

The Delhi observatory was the first astronomical observatory of Sawai Jai Singh II. The glorious observatory is popularly know as the Jantra – Mantra of Delhi. Now it is a national monument of India. The Archaeology Department of India take charge to preserve Delhi observatory.

In the Asian Games, the composite instrument (Miśra yantra) of Delhi observatory was chosen as the logo of Asiad in 1982 CE.

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The Delhi observatory is one of the most important and popular tourist place of India. The Delhi observatory is played an remarkable role in the Jouney of Indian astronomy.

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