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Technical Travellogue / Reinventing IKS

Exploring Jantar Mantar, New South Indian Experiment, Reviving Ancient Indian Knowledge System in Astronomy, Astrophysics, Astrology and Mathematics

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Abstract

This study explores the Background, Objectives and revival of Jantar Mantar, the ancient science of instrumentation to measure time and position of Astral bodies. Traditionally, Jantar Mantar was established in North India at 5 places (Ujjain, Jaipur, Delhi, Kāshi and Mathura). This tradition is now brought to South India at Bhārati Yōga Dhāma, Mysore (BYD, Mysore). The study explores how this experiment to revive the ancient knowledge in South India can help the Indian knowledge System.

Keywords: Jantar Mantar, Astronomy, Astrology, Astrophysics, Mathematics, Jyotishya Shastra, Indian Knowledge System (IKS)

Introduction

Jantar Mantar points to Indian Astronomical observatories built by Maharaja Jaisingh II of Jaipur built at 5 places in North India (Jaipur, Ujjain, Delhi, Banaras and Mathura). They were built as big geometric instrument civil engineering constructions between 1724 and 1735. The instruments constructed here are described in Ancient Indian Astronomy and Astrology texts. The instruments are designed to track the Sun, Moon and Planets. Instruments are aligned using Stars. Instruments give readings to measure Time, calibrate Panchānga/Calendar. Bigger instruments were constructed to improve precision in measured values.

After the colonial takeover of India, support for Indian Astronomy died and Western Calendar and Western Astronomy was imposed. However, the Indian Civilians followed the traditional Panchānga/Indian Calendar. Although there was a huge user base, apart from maintaining the panchānga, no serious work continued. Even to maintain panchānga, Ephemeris, the transcoding table to map a place and associated time corrections to a reference standard place (like Ujjain to map celestial objects) was used. This short cut method destroyed Observation based and Research oriented Jantar-Mantar usage. Shortcut methods use approximations and introduce errors. Hence today's panchānga contain accumulated errors and do not exactly show the true position of celestial objects.

Bhārati Yoga Dhāma has taken the mammoth task of building Jantar-Mantar costing crores of rupees in south India and they are starting to rebuild the ancient traditional method of Astronomy, Astrology based on observations using Jantar-Mantar instruments. The initiative has a noble goal of correcting errors in the Indian traditional calendar/Panchānga, to make it more precise. Elimination of errors in Panchānga should improve Astrology predictions. Improved results should bring back the lost trust in Astrology across the society. Bhārati Yoga Dhāma has a strong opinion that Indian Astrology developed by our Maharshis since Vedic times is based on verifiable data and hence it is a science. They want to establish this point using Jantar-Mantar. If they succeed, it will be a major contribution to the Indian Knowledge System, as Jyotishya/Astronomy is one of the six parts associated with Vedas (Called Vedāngās : Shiksha, Chandas, Vyakarana, Nirukta, Kalpa, Jyotisha).

Revered Sage Nārada has explained the importance of Astrology in texts as follows

*सिद्धान्तसंहिताहोरारूपस्कन्धत्रयात्मकम् ।
वेदस्य निर्मलं चक्षुर्ज्योतिःशास्त्रमनूत्तमम् ॥*

Meaning: Astrology is a great science and is a sacred part of the Vedas. It comprises three Skandās (Chapters). Siddhānta, Samhita and Hora. Siddhānta (Measurement, Calculation and Observation wing). Samhita (Information about everything like planets, animals, rain, building constructions [vāstu] etc.). Hora (phalita, Using planets position in the Zodiac Signs one can tell Bhuta [Past], Bhavishya [Future] and Vartamāna [Present time] of anyone/anything). Bhārati Yoga Dhāma is primarily focussing on Siddhānta.

Just because a few scientists oppose Astrology it does not mean that in this scientific age Astrology is a farce. This verdict has been given by the Supreme Court of India as well. In the 2004 landmark case (P.M. Bhargava Vs. University Grants Commission), the Supreme Court of India ruled that Astrology (Jyotisha) is a discipline requiring the study of celestial bodies, and legally permitted universities to offer courses and degrees in Vedic Astrology. The verdict primarily focused on academic autonomy and policy rather than scientific validity.

Indian constitution calls for a fundamental duty to its citizen through article 51-A(h)

Article 51-A(h): Makes it a duty for every citizen to "develop the scientific temper, humanism and the spirit of inquiry and reform."

Bhārati Yoga Dhāma's efforts are aligned with this objective. They are structurally building an eco-

system as per modern scientific practices to rebuild Astrology. Their comprehensive Trayi Vidya (Yoga, Ayurveda and Astronomy) covers, treats and develops 3 Indian knowledge systems as scientific streams.

Methods

This paper is a study report. I visited Bhārati Yoga Dhāma, interviewed the different stake holders and documented their views, objectives, Journey & what has been achieved so far etc. The aim of the paper is to increase visibility among academic community and bring interested person/institutions to join hands and derive useful knowledge/research out of it.

I visited Bhārati Yoga Dhāma on Friday, 5th June 2026. Sri Purushottam Joshi was assigned to take us on a guided tour. Jantar Mantar in Bhārati Yoga Dhāma is a reserved space of about 5 acres. Several instruments have been constructed and are now open to the public for visit. The site is not complete, as they need funding support to complete the planned infrastructure.

The details of the project and various issues discussed during the visit is reported here.

Motivation and Goals behind the project

Motivation is to bring North Indian bound Jantar-Mantar to South India and make the facility available to scholars, researchers, teachers, practitioners, students and general public. The idea is to revive the Ancient Indian knowledge of observation-based astronomy and astrology. Do further research and develop the stream.

Stated objectives are as follows.

Indian cultural rituals and daily practices are best performed by observing *Muhurta* (Right timing) in order to reap the greatest benefit.

Bhārati Yoga Dhāma's current research to calculate *Thithi* (lunar day) will help establish a definitive Panchāngam (calendar and almanac) using these unique methods of observation and calculation.

- Audio-video presentations designed to educate the public about the relationship between astrology and the Indian way of life.
- Will conduct objective assessments of ancient and modern astrophysics using astronomical observations and calculations.
- Access to ancient astrological texts and research for Gurukula students, international researchers

and global scholars interested in planetary influences on human life and the world.

- Includes a museum and theatre drawing thousands of public visitors to this important astronomical complex.
- Aims to bring uniformity to the Panchāngas (Indian calendars) through rigorous scientific observations.
- Enlighten modern society on the important insights of ancient astrologers like Aryabhata, Bhaskarāchārya, and Varāhamihira, whose contribution to astrology and astronomy have been long forgotten.

JM at Mysuru is the brainchild of Dr. Shankaranarayana Jois (Fig.1).



Fig. 1. Acharya Shakarnarayana Jois at Jantar Mantar site at Bhāratī Yoga Dhāma, Mysore, India.



Fig. 2. Grand Statue of Ācharya Varaha Mihira at Bhāratī Yoga Dhāma, Mysore, India.

Instruments implemented

- **Shanku Yantra** - Measure Dik, Desha and Kāla.
- **Dhruva Darshana Bitti** - Measure Dhruva, The Pole Star
- **Yantra Sāmrat** - Measure local Solar time and Declination
- **Nādi Valaya** - Track Sun as per Uttarāyana and Dakshināyana, Measure time
- **Kapāla Yantra** - Simulate and track Sun in celestial space
- **Krāntivrutta Yantra** - Measure the celestial latitude and longitude of the Sun, Planets, and Zodiac constellations
- **Rama Yantra** - Measure position of any celestial object.
- **Bitthi Yantra** - Measure Celestial Bodies Altitude, when it crosses the Meridian

The details of the same are presented here.

Shanku Yantra

Shanku in astrology refers to the needle. Shanku Yantra is one of the oldest astronomical instruments in India. Described in ancient texts like the Surya Siddhānta and works by Aryabhata and Varāhamihira. It is the foundational tool of traditional Indian astronomy and Panchānga. It is simply a vertical gnomon (rod) on a flat, horizontal surface. By measuring the shadow's length and direction, ancient astronomers accurately determined cardinal directions, local time, and seasonal changes (*Dikku, Desha, Kala*).



Fig. 3. Shanku Yantra, Bhāratī Yoga Dhāma, Mysore, India



Fig. 4. Shanku Yantra, Jantar-Mantar, Ujjain, India.

How it works

- **Tracking Time:** When sunlight hits the vertical rod, it casts a shadow on the platform. The shortest shadow marks local noon, pinpointing the North-South line.
- **Tracking Seasons:** Shadow lengths shift throughout the year. The shadow is longest during the winter solstice and shortest during the summer solstice.
- **Calculating Latitude:** If the height of the rod is known and the shadow's length is measured, basic trigonometry is used to find the latitude of a location.

Dhruva Darshana Bitthi Yantra

“Dhruv Darshana Bitthi” is an ancient astronomical instrument designed to determine the exact position of the Pole Star (Dhruva Tāra) at night and measure the declination of celestial bodies.

It is a trapezoidal stone masonry structure inclined at an angle equal to the local latitude. The sloping upper edge is perfectly aligned to point toward the celestial North Pole (the Pole Star). A smaller handheld/portable metal plate called the “Dhruvabhrama Yantra” is also mentioned, which was used for night time navigation and calculating star positions, while on travel.

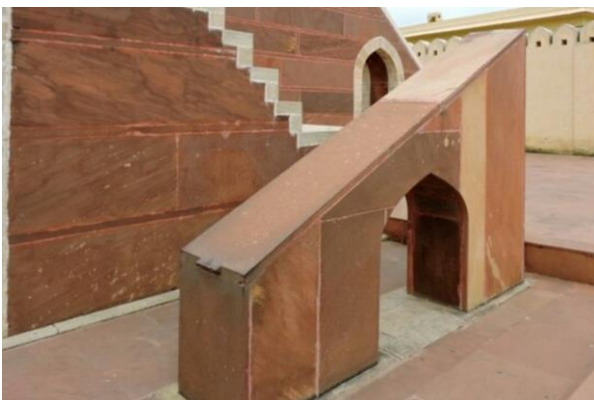


Fig. 5. Dhruva Darshana Bitthi, Jantar-Mantar, Jaipur, India.

How it works

- **Locating Pole Star:** Looking at the direction of the arrow, marked at the bottom during night, one can locate the pole star. Historically, it served as a compass, enabling ancient astronomers to track the positions of the 12 zodiac signs and gauge the time of night by observing the sky.

Yantra Samrāt

The Yantra Samrāt is a monumental equinoctial (=aligned to equinox) sundial that measures local solar time, celestial coordinates, and sun declination. It is a massive structure and main instrument of the Jantar Mantar complex. Bigger structure means more precise measurement of time.

Yantra Samrat at Jaipur is the biggest among the sun dials. The instrument has readings to the precision of 2 seconds.



Fig. 6 Yantra Samrat, Bhārati Yoga Dhāma, Mysore, India.

How it works

- **Measure Local Time:** When sunlight hits the central triangular structure, it casts a shadow on the circular construction. The circular structure is the dial with scale, to read time. The shadow falls from Sunrise to noon on one side. Shadow moves to the other half between noon to Sunset. The instrument gives time between Sunrise and Sunset.

Nādi Valaya

The Nādivalya Yantra is an ancient equinoctial sundial used in Indian astronomy to measure local solar time and track the Sun's movement across the equator. It features two circular, flat dial plates—one facing north and the other facing south—that are perfectly parallel to the Earth's equator. Metal rods (Shanku's) extend perpendicularly from the center of each dial, pointing directly toward the celestial poles.



Fig. 7 Nādivalaya Yantra, Bhārati Yoga Dhāma, Mysore, India.

How it works

- Track Sun Time: When sunlight hits the vertical rod (Shanku, the needle), it casts a shadow on the circular dial.
- The two dial plates are utilized at different times of the year depending on the Sun's hemisphere
- Equinoxes: On the exact dates of the equinox, the Sun's rays are parallel to the equator, illuminating both faces simultaneously
- Summer (March 21 to September 22): The Sun is in the northern hemisphere, illuminating the northern dial face
- Winter (September 23 to March 20): The Sun is in the southern hemisphere, illuminating the southern dial face.

Kapāla Yantra

Kapāl yantra simulates celestial conditions. It consists of two complementary, hemispherical concave marble bowls built into the ground on an east-west axis. The inner surfaces of the bowls are engraved with intricate celestial coordinates. The primary purpose is to track sun and transform graphically the horizon system of coordinates into the equatorial system



Fig. 8 Kapāla Yantra, Bhārati Yoga Dhāma, Mysore, India.

How it works

- Simulate sun in celestial space: The western bowl measures the sun's position on the local horizon, while the eastern bowl graphically transforms this data into equatorial systems (to map the stars)
- It operates as a highly advanced sundial and coordinate converter
- Unlike instruments that only map a single celestial view, it is specially designed to transform coordinates directly from one system to another.

Krāntivrutta Yantra

Krāntivrutta means Ecliptic. Ecliptic refers to the imaginary, circular path in the sky that the sun appears to follow over the course of a year when viewed from Earth. Because Earth orbits the sun on a tilted axis, the sun's path (the ecliptic) is tilted at an angle of roughly 23.5° relative to the Earth's equator.

The primary purpose of Krāntivrutta Yantra is to measure the celestial latitude and longitude of the sun, planets, and zodiac constellations.

It consists of two circular metal frames (about the size of a ship's navigation wheel) that rotate on a masonry base. One wheel represents the celestial equator, while the other represents the ecliptic plane of the Earth. The two frames and their base are set at an exact angle of 47° to measure coordinates.



Fig. 9 Krāntivrutta Yantra, Bhārati Yoga Dhāma, Mysore, India.

How it works

- Measure readings in Ecliptic: Unlike simple sundials that measure the sun's position relative to the local horizon, the Kranti Vritta Yantra measures coordinates using the ecliptic system (the plane of the Earth's orbit around the sun).

- An observer looks through the instrument to align its axis with a specific celestial body. Once aligned, the scales engraved directly onto the circles provide immediate readings for the object's Right Ascension and its ecliptic longitude and latitude
- It allows astronomers to directly determine the position of celestial bodies in the ecliptic coordinate system without complex calculations.

Rama Yantra

The Rama Yantra is one of the most unique and innovative instruments. It consists of two identical, open-to-the-sky cylindrical buildings. The floor of each structure is raised to chest height and split into radiating stone sectors, with open spaces between them. One building's stone sectors correspond exactly to the empty gaps of the other. A tall, vertical pillar stands perfectly in the dead centre of each cylinder. The height of the walls and the central pillar are exactly equal to the internal radius of the structure. The walls and stone floor sectors are finely etched with degree markings to measure altitude (vertical angle above the horizon) and azimuth (horizontal compass direction).



Fig. 10 Rāma Yantra, Jantar-Mantar, New Delhi, India.



Fig. 11 Rāma Yantra, Bhāratī Yoga Dhāma Mysore, India.

How it works

- Daytime Observations: The sun's position is recorded by observing exactly where the shadow cast by the tip of the central pillar falls on the calibrated floor or walls
- Night time Observations: An astronomer stands inside the empty gaps of the structure, looks up, and uses a sighting thread tied to the top of the central pillar to align a target star or planet, reading its coordinates directly off the scale.
- Because the buildings are exact spatial opposites, if a celestial body's shadow falls into an empty walking gap in the first structure, the observer simply moves to the second structure to take an uninterrupted reading.

Bhitthi Yantra

Bhitthi Yantra, also called The Daksinottara Bhitthi, is based on the meridian dial of earlier times. It incorporates a quadrant or half-circle inscribed on a north-south wall, with a metal rod at the center. The meridian is an imaginary plane running north-south in line with the earth's axis and extending directly overhead.



Fig. 12 A model of Bhitthi Yantra



Fig. 13 Bhitthi Yantra, Bhāratī Yoga Dhāma, Mysore, India



Fig. 14 Inside view of Bihitthi Yantra, Shastamsha Yantra, Bhāratī Yoga Dhāma, Mysore.

How it works

- At midday, the sun casts a shadow of the rod onto the Semicircular scale, giving the meridian altitude. The instrument may also be used at night to obtain the meridian altitude of other celestial bodies. Although seemingly basic, meridian-altitude measurements can be used to determine other astronomical data such as local latitude and the obliquity of the ecliptic.

Instruments coming up

- **Rāshivalaya Yantra** - The Rāshivalaya Yantra is a set of 12 unique astronomical instruments (sundials). Each Yantra is for a Zodiac symbol. The angle of each instrument (Gnomon angle) is different from each other, because each zodiac sign is located at a different position on the ecliptic. When a particular zodiac sign reaches the local meridian, the instrument of that particular zodiac sign is used to take accurate astronomical measurements for about 2 hours. Primary purpose is to work on Almanacs & Predictions.
- **Jaya Prakāsha Yantra** - This yantra includes two hemispherical bowls like sundials with graded marble slabs. The elevation, azimuth, hour angles and exact position of heavenly bodies are detected using the inverted image of the sky, and the movement of the inverted shadows on the slabs
- **Chakra Yantra** - The Chakra Yantra is a major Astronomical instrument which is mainly used to measure the speed of the Sun, its inclination and celestial coordinates.
- **Gola Yantra** - It is known in the West as the Armillary Sphere, is an ancient astronomical instrument composed of interlocking metal

rings. The device maps the celestial sphere, modelling the equator, ecliptic, meridian, and horizon to track stars and calculate planetary positions. It is a 3D map of the sky. The metal rings represent major celestial pathways, including the Sun's path (the ecliptic) and the constellations of the zodiac. It is primarily used as a teaching aid to understand the geocentric model of the cosmos.

Results and Discussions

The Indian Knowledge System (IKS) is not just theory. It included laboratory experiments. Jantar-Mantar was an observatory and a laboratory. Practitioners built and used a host of scientific equipment to study nature and build knowledge systems. Jantar Mantar at Bhāratī Yoga Dhāma, establishes this important point and provides evidence to prove the Indian Knowledge System is not some random thought process, but a structured knowledge system. Data is collected, analysed, knowledge refined, discoveries and inventions were made, universities were built.

The facility is an important modern experiment to revive and structurally practice ancient astronomy, astrology, astrophysics and associated mathematics as living examples.

Conclusion

The paper primarily discusses technicality of instruments available at the facility and what can be measured from them. What new instruments are being planned?

We hope the paper will increase awareness and visibility on this important experiment being carried out in south India. It brings together Academicians, Researchers, Practitioners, Teachers, Students and General Public interested in the subject. It will help to derive and re-build useful Indian Knowledge System.

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