

THE ESTABLISHMENT OF OBSERVATORIES AND THE SOCIO-ECONOMIC CONDITIONS OF SCIENTIFIC WORK IN NINETEENTH CENTURY INDIA*

S. M. RAZAULLAH ANSARI

Physics Department, Aligarh Muslim University
Aligarh

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It is known that two of the important astronomical observatories of the last century were the Madras observatory established in 1792 by the East India Company, and the Royal observatory at Lucknow established by King of Oudh, Naşiruddin Haydar, in 1832. In this paper we trace briefly the history of the establishment of these observatories and mention astronomical work done there. Moreover we discuss the socio-economic difficulties experienced by the astronomers at these observatories in furthering their scientific work. Finally enumerating a few historical problems which have arisen during the course of this study, we emphasize the need of further work in the history of astronomy and scientific institutions of 19th century India.

1. INTRODUCTION

Defining an observatory as an institution of *organised* astronomical observations done by a team, in contrast to places where such work is done by individuals, one may assert that astronomical observatories were instituted for the first time in India in the seventeenth century; the father of those observatories was well-known Raja Sawai Jai Singh II (1686-1743)^{1,2,3}. However, in this paper we do not wish to deal with Raja Jai Singh's observatories; what we intend to present here first is a brief history of the establishment of some of the modern astronomical observatories in nineteenth century India, modern astronomy being defined as that in which optical telescopes and astronomical (mechanical) clocks played the main role as astronomical instruments.

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In passing, it may be added that Raja Jai Singh employed for observations also *telescopes* which he claimed to have had constructed in his own kingdom. This is clearly stated in his *Zij-i Muhammad Shāhī*. In these astronomical tables he even enumerates a number of his telescopic observations, namely, the ellipticity of the orbits of moon and sun, the phases of Mercury and Venus, the existence of sunspots and their annual rotation and the four satellites of Jupiter. The use of telescopes by Jai Singh was in fact first noted by Sir Sayed Ahmed Khan (1817-98) in his *Āthār al-Sanādid* (Description of historical Monuments in and around Delhi). Whereas in its first edition (Delhi, 1847) he just mentioned under Delhi observatory (*Jantar Mantar*) that telescopes were installed on *Samrāt Yantra* and observations were carried out with their help, in the second edition of the book (Delhi, 1854) he even described with reference to Jai Singh's *Zij* the interaction of Jai Singh and European Jesuit astronomers and also listed the above mentioned discoveries. How strange that G. R. Kaye in his classical work: *The Astronomical Observatories of Jai Singh* (Calcutta, 1918) was not aware of this significant aspect of Jai Singh's astronomy. The later workers repeated the same mistake by not going through the primary source, i.e. the *Zij*, carefully^{1b}.

It is known today² that in the last century half a dozen astronomical observatories were founded in India, namely at Madras (in 1792), Calcutta (in 1825), Lucknow (in 1832), Trivandrum (in 1837), Poona (in 1842) and another at the Poona College of Science in 1882.⁴ Out of these the first two were established by the East India Company (E. I. C.), those at Lucknow, Trivandrum and Poona College by Indian monarchs and the other one at Poona in 1842 by Capt. W S. Jacob as his private observatory. In the following we shall deal briefly with two of these observatories, viz. the Madras and Lucknow observatories; a detailed account of all these observatories has been dealt elsewhere.³ It may be added here in passing that these two observatories in particular, were equipped with the best instruments of their time and the astronomical work done there entitled them to take rank with any European observatory of the last century.

2. MADRAS OBSERVATORY

This observatory was founded by East India Company (E. I. C.) on the initiative of Michael Topping (1747-1796) who served the Company as an excellent surveyor and astronomer. Topping proposed to the Madras Government to acquire the private astronomical observatory built by William Petrie (died 1816), who was a member of Madras civil service and in 1789 was leaving India for some time. Topping made a case for the establishment of the observatory as follows⁵ :

“The astronomical observatory built by William Petrie Esq. for his own private use, but which by his permission has, since the commencement of my operation, been occupied in the public service, becomes liable to be transferred into other hands and is in danger of being no longer accessible Should these consequences ensue, the geographical work I am conducting will hazard a total deprivation of the correspondent observations essential to their confirmation and perfection.”

Another argument offered by him was to found actually a “depository” for not only Petrie’s instruments but also for instruments of the E. I. C., viz. astronomical clock and quadrant, telescopes etc. In 1790, the E. I. C. agreed that an observatory be established at Madras as it “would be of very great advantage to Science.”⁶ In fact this basis for the foundation of the observatory was exactly in consonance with the ideas of Topping. He considered “astronomy as the Parent and Nurse of Navigation” and cherished the ideal to see “the charts of these Eastern seas in a more correct state than those even of Europe; or at least a regular system established for the perfection of Indian Geography.”⁷

In 1792 the building of the observatory was completed and in the same year it started functioning with Topping as the director and the Dane John Goldingham (died 1849) as his assistant. Goldingham, who succeeded Topping after his death, remained loyal to the ideal of his predecessor; he also believed that⁸

“..... a public observatory is an establishment for observing the heavenly bodies with a view to the improvement of the tables and geography and navigation ... ”

It is therefore not surprising that Goldingham’s notable contribution was the determination of the longitude of the observatory as $80^{\circ}18'54''$.

Goldingham relinquished his job in 1830, and his successors T. G. Taylor (1804-1848), W. S. Jacob (1813-1862) and N. R. Pogson (1829-1891) changed completely the emphasis of the programme of work at the observatory. Astronomical observations were done then for the sake of furthering the *science* of astronomy. As a result, the star catalogues of Taylor and Jacobs and Pogson’s discoveries of several minor planets in the Indian sky brought forth the name of the observatory in the annals of astronomy. We donot want to go further into the details⁹ and consequences of that work but may add that with the indefatigable efforts of Pogson and his successor Michie Smith the observatory was shifted to Kodaikanal and converted into an astrophysical or rather a solar physics observatory at the turn of the century. Today Kodaikanal observatory is world-famous and is one of constituent units of the Indian Institute of Astrophysics at Bangalore.

3. LUCKNOW OBSERVATORY

In contrast to the origin of Madras observatory which, as we have briefly traced above, was based on the *practical needs* of geography and navigation*, the establishment of the Royal Observatory at Lucknow in 1832 by King Nasiruddin Haydar (who reigned from 1827-1837) was motivated by *ideal needs*. In founding the observatory the King had a two-fold objective :¹¹

“To establish the observatory upon a liberal scale worthy the wealth and importance of the government as well for the advancement of the noble sincerely new discoveries as for the defusion of its principles amongst the inhabitants of India, for the establishment is intended to embrace translations into the native language and to instruct the inhabitants here. It is contemplated to deliver lectures upon astronomy to the students of the college and to select talented youths for instruction in every branch of science...”

No doubt commendable ideals ! The King requested the Governor General to release the best person available at that time, namely Capt J. W. Herbert (1791-1833) for the appointment as Director of the Observatory¹². Capt. Herbert was a well-known man of science, who took a leading part in the activities of the Asiatic Society of Bengal at Calcutta and in 1832 was nominated to form an Indian Committee of the British Association for the Promotion of Science. Herbert planned and supervised the construction of the building of the observatory—known later as “Tarewali Kothi.” Unfortunately due to Herbert’s sudden death in 1833 the construction work was held up till the appointment of Col. R. Wilcox (1802-1848) in 1835. Like his predecessor Wilcox was also esteemed at that time as “an excellent observer, a skilled mechanic and practised computer.....pre-eminently fitted.....for the post of astronomer.”¹³ From the appointment of such eminent men as directors of the observatory one may conclude that the aim of the King was really that his officers should “contribute to the advancement of astronomy by affording a series of important observations,” and thereby “do credit to the Government of Oudh.”

The observatory was equipped with the best instruments constructed by the same makers who supplied also to the Greenwich observatory. According to the Surveyor General of India they were “far superior to the apparatus in the Madras and Bombay observatories.”¹⁴ The astronomical work done by Col. Wilcox and his two Indian assistants consisted mainly of observation

*It may be mentioned here that the Royal Observatory at Greenwich (England) was founded by King Charles II in 1675 also to find out “longitudes of places for perfecting Navigation and Astronomy.”¹⁰

of the eclipses of Jupiter and the major planets as well as observation of the then recently discovered minor planets : *Ceres*, *Vesta*, *Pallas*, and *Juno*. Moreover, stellar positional astronomy was also extensively practised at the observatory.¹⁵

Unfortunately none of Wilcox's observations was ever published, although he tried very hard for it. In that connection he corresponded presumably with the Royal Astronomical Society, discussed the problem many times in his reports to the Governor General, he even got a small grant of Rs. 6000/- from the King of Oudh for that purpose and toyed with the idea of possessing a printing press at the observatory similar to the one at Madras observatory. After his death in 1848 none less than the influential scholar Dr. A. Sprenger (Principal, Delhi College) continued these efforts on his behalf,¹⁶ but inspite of everything Wilcox's dream of having the Lucknow astronomical observations published was never fulfilled.

Whereas the Madras observatory, as mentioned above, developed continuously in the last as well as in this century, Lucknow observatory was abolished by order of the king Wajid Ali Shah (reigned 1847-56) on January 20, 1849. One of the reasons for the abolition is stated to be that "the King discovered that it was not enough to build and equip and pay an observer, but that it was also necessary to publish the results and this publication called for an annually recurring expenditure, his interest rapidly waned..."¹⁷ This opinion is not borne out by records. As mentioned above, the King did sanction a grant for printing the results and actually he insisted on their being printed in India, whereas Wilcox on technical grounds preferred their being printed in London. Besides, the King was already prepared for an expenditure on "liberal scale," as mentioned in the King's letter at the time of the observatory (see the quotation at the beginning of this section). As a matter of fact, the King Wajid Ali Shah himself in his letter to the then resident at Lucknow—Lt. Col. W. A. Sleeman—maintained that "the great outlay incurred in maintaining it [i.e. the observatory] has produced no advantage whatever either to the state or to the people and learned of Oudh."¹⁸ Another viewpoint concerning the abolition is that of the resident himself. According to him the reason for the abolition was the annoyance of the King at many remarks made by Kamaluddin Haydar—an employee of the observatory for translation of scientific treatises into Urdu—in his "History of Oudh" (*Kaişar-al-Tawarikh*) written in Urdu.¹⁹ The matter was probably not so simple as it was made to appear, but it is not our aim to go into a detailed assessment of opinions on the abolition here. We intend to deal with it elsewhere.

4. THE SOCIO-ECONOMIC CONDITIONS FOR SCIENTIFIC WORK IN NINETEENTH CENTURY INDIA

A detailed study of the conditions for scientific work in nineteenth century India is yet to be made. In the following we present only some ideas and/or conclusions arrived at on the basis of the present investigation, showing that the main problems of the astronomers seemed to concern

- i) the emoluments of the astronomers in contrast to administrators,
- ii) the possibility of promotions, and
- iii) the attitude of the colonial administration towards the scientists and scientific work.

The records show that the second government astronomer at the Madras observatory, John Goldingham, drawing a salary of 192 Pagoda (1 Pagoda, a gold coin=3-4 Sonaut Rupee), concurrently worked for a few years as an architect or civil engineer also, i. e. as incharge of all buidings at Madras town. He was allowed to earn a commission of 15% on the total cost for building and repair. Whether this sort of a second employment was usual for all Madras astronomers we do not yet know. But one finds another example in the case of Prof. K. D. Naegamvala, director of the Takhtasinghji observatroy (established in 1882) at Poona, who was simultaneously working as a Professor of Physics at Bombay University. Was such double employment due to a low salary structure for these scientists?

This conjecture of ours²⁰ has now been corroborated by the following evidence.²¹ According to N. R. Pogson—Director of Madras Observatory 1861-1891—the director's salary was raised some time in the eighties of the last century from Rs. 672 to Rs. 800, yet it was quite inadequate and "not befitting his rank in science." For comparison a principal of a high school then got a salary of Rs. 1000, first class officers of the Trigonometrical Survey of India drew not less than the same amount, while the starting pay of the Meteorologist to the Govt. of India was Rs. 1350. Besides, Pogson's assistants—first his son and later his daughter—were just drawing Rs. 150, "equal, I [Pogson] suppose, to that enjoyed by Governor's coachman or cook, a fifth of that a native or East India Deputy collector."²² No wonder Pogson had to earn an extra Rs. 250 p. m. by supervising meteorological observations, which he could ill afford to forego in view of his large family of eleven children.²³ Many a time in his letters to Astronomer Royal Sir George Airy, Pogson complained about his low economic position and inferior status to other officers of the Govt of India.

This opinion is also corroborated by a point made in a report submitted to India Office (London) by Sir Norman Lockyer, who toured all the Indian observatories in 1896 when he came to India heading a solar eclipse expedition. Lockyer wrote :²⁴

“The chief disadvantages under which scientific men now labour in India are want of promotion and of graded increases of salary throughout their service. Men of science are after all men, and are no more likely than others to work heartily without any hope of increased pay or advancement, especially when they are reminded by the promotion and increased emoluments to those in other branches of the same state service ..”

Obviously this policy of the then Indian Government, i. e. “of treating its scientific servants on a different principle from that adopted in other departments” was not very conducive to the promotion of any science. Besides, Lockyer also noted the contempt with which the scientists were regarded by the British administrators. In fact according to J. F. Tenant, Director of Madras observatory from 1859 to 1860,

“ in high Indian circles men of Science are considered as loafing imposters who trade on the general ignorance at home.”²⁵

Naturally, Sir Lockyer pleaded for a better status for scientists in India and for the recognition of their work.

Finally we feel we should add a word or two about the technical difficulties under which scientific work was carried out at these observatories. Too much routine work like overhauling of ship’s chronometers,, meteorological and magnetic observations bogged down the astronomical research. This was true for Madras as well as for Lucknow. In case of the latter the Governor General even ordered an explanation from Col. Wilcox why a meteorological register was not kept at Lucknow observatory.²⁶ Wilcox pleaded “not guilty of any lapse, since he was not aware that meteorological registers were supposed to be a part of his duties.” He further argued : “I have not found any instance of their being indebted to any observatory for their meteorological journals In short, meteorology is considered quite separate from the science of astronomy.”²⁷ In spite of all this explanation Wilcox did keep meteorological and magnetic registers later and often—though half-heartedly—reported on those observations. As mentioned before, Pogson had to do the same due to financial reasons although he considered that “to require such an officer [i. e. an astronomer] to neglect his far higher pursuits and dabble in such comparative trifling as Meteorology is past all endurance.”²⁸

5. SUMMARY

Astronomy as developed in India in the last century by the East India Company, the British Government and Indian Monarchs had its origin in various practical and intellectual needs of the time. Although the astronomers had to work under difficult circumstances like low salaries and social status, too much routine work, too little staff, especially no European or Europe trained assistant, and bureaucratic formalities like limited distribution of their publications through Government channel, yet the work done in Indian observatories in the last century was of first grade, ranking with that done at any European observatory. In fact it took nearly a century to get recognition for astronomy in India as a science in its own right. In this development there are many unexplained problems regarding the efforts of the British national working as astromers in India, the help they could get from their foreign friends, and the policy adopted by the then Government. It is therefore pleaded that the history of such scientific disciplines like astronomy and also that of scientific institutions like observatories should be studied in depth.

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NOTES AND REFERENCES

- ^{1a} Bose, D. M. Sen, S. N. and Subbarayappa, B. V. (Ed.). *A Concise History of Science in India*, Indian National Science Academy, New Delhi 1971. p. 101 and 126. Note, that on p. 101 the year of death of Jai Singh is wrongly given as 1734, it is 1743.
- ^{1b} For these works see Blanpied, W. A. The Astronomical Program of Raja Sawai Jai Singh II and its Historical Context, *Jap. Stud. in Hist. Sci.*, No. 13, 87-126 (1974). See also W. A. Blanpied: Raja Sawai Jai Singh II: An 18th Century Medieval Astronomer, *Am. J. Physics*, 43, 1025-1035 (1975). For a detailed recent account on Jai Singh's use of the telescope see Ghori, S. A. Khan, Muhammad Shahi Observatory at Delhi or Jantar Mantar (in Urdu). *Ma'arif* (Azamgarh) 121. 32-48, 105-120, 189-206 (1978). Cf. also S. A. Khan Ghori, The Impact of modern Astronomy on Raja Jai Singh. *Proceedings of National Seminar on Technology and Science in India during 1400-1800 A. D.*, April 20-21, April 20-21, 1978 (to be published in I. J. H. S.).
- ² Ansari, S. M. R. Astronomical Activity in Medieval India, paper read at the International Symposium on Observatories in Islam, held at the 400th Anniversary celebration of Istanbul Observatory, Istanbul, September 19-23, 1977 (to be published). Here the latest work on Jai Singh's astronomical work has been reviewed and presented as a culmination of the astronomical activity of the Mughal period of Indian history,

- 5 — On the Early Development of Western Astronomy in India and the Role of the Royal Greenwich Observatory, *Archives Internationales d'Histoire des Sciences*, 27, 237-262, 1977. See also, Ansari, S. M. R. Dissemination of European Astronomy in India, a chapter in *General History of Astronomy*, Ed. M. A. Hoskin. (Cambridge), Vol. 3. (forthcoming publication).
- 6 Ansari, S. M. R. 'Naegamvala, K. D. 'the First Astrophysicist of India', paper read at the XV International Congress of the History of Science, held at Edinburgh, Aug. 10-19, 1977, (Scientific Section IV, Physics and Astronomy since 1600), see Book of Abstracts of the Congress p. 94. (To be published). Naegamvala established the Poona Observatory and performed spectroscopic observations of Nebulae and of Solar eclipses.
- 7 *Military Political Consultations*, dated 27.1.1789, Quoted in ref. 6.
- 8 Phillimore, R. H. *Historical Records of the Survey of India*, Vol. I (18th Century) p. 171-174, Dehradun 1945.
- 9 *Military Political Consultations*, dated 27.12.1791, quoted in ref. 6.
- 10 J. Goldingham to Colin Mackenzie, dated 16.7.1817, quoted in ref. 6, Vol. III (1815-1830), p. 186-187.
- 11 See for details ref. 3, section 3.1, cf. also ref. 1, p. 505 for a brief account.
- 12 Warrant of King Charles II, dated 22.6.1675, quoted in P. S. Laurie, *The Old Royal Observatory*, National Maritime Museum, Greenwich, 1972.
- 13 J. Paton to the Secretary to Governor General, *Political Consultations* No. 31, 28.10. 1831 (unpublished historical records.)
- 14 Nasiruddin Hayder to J. Paton dated Sept. 8, 1831, *ibid*.
- 15 *Dehra Dun Survey Records* 462 (232-4), 10.11.1845, quoted in ref. 6., Vol. IV p. 115. This estimation of Wilcox is by Col, A. Waugh, Assistant to Sir George Everest.
- 16 From a letter of Surveyor General of India, 1852, quoted in ref. 6, Vol. IV p. 116.
- 17 From the reports of Col. Wilcox to the Governor General of India (1841-1848), unpublished. For details of instruments etc. see ref. 3, section 3.3.
- 18 A. Sprenger to the Secretary of the Royal Astronomical Society, dated Sept. 14, 1849, published in *Monthly Notices of Roy Astron. Soc.* 11. 92-93 (1851).
- 19 Dreyer, J. L. E, Turner, H. H. *et al. History of the Royal Astronomical Society, 1820-1920* (R.A.S., London), 1923, p. 119. In continuation of the quotation above, it is stated that "he [King] finally in 1848 discharged the director." This is in fact historically wrong. The director Col. Wilcox died on Oct. 25, 1848, the Observatory was abolished on Aug. 8, 1849 i. e. long after his death.
- 20 Reply of the King to the Resident's letter of Aug. 18, 1849, dated Sept. 14, 1849, *Foreign (Political) Consultations* No. 130-136, Oct 1849 (unpublished records.)
- 21 *Foreign (Political) Consultations*, No. 130-136, Oct. 6, 1849.
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- ²¹ Pogson, N. R. *A Letter Addressed to Brig. R. C. Stewart Adjutant General, Madras*, Respecting certain official Grievances and Obstructions Deterimental to the Welfare of Astronomical Science in India, and Suggestions as to their Remedies, (Printed), Madras, June 30. 1877, esp. p. 4, 10 et seq.
- ²² Pogson, N. R. to Airy, G. letter dated Dec. 2, 1876, *Royal Greenwich Observatory Archive at Herstmonceux*, ref. no. 749. (unpublished). Also ref. 21, p. 4.
- ²³ Pogson, N. R. to Airy, G. letter dated Jan. 29, 1874 (*Herstmonceux archive*, ref. no. 748).
- ²⁴ Lockyer, N. *Report on Indian Observatories and their Organisation* (London) 1898, esp. p. 36. See also A. J. Meadows, *Science and Controversy, a Biography of Sir Norman Lockyer*, M. I. T. Press, 1973. p. 233.
- ²⁵ Tennant, J. F. to Lockyer, N. letter dated July 25, 1875 (*Archives of N. Lockyer*), quoted in A. J. Meadows, *A Tour of the Indian observatories in 1898*, preprint, University of Leicester.
- ²⁶ *Political Consultation* No. 136, May 18, 1840 (unpublished).
- ²⁷ Wilcox R. to Col. Caulfield, letter dated July 8, 1840 (unpublished)
- ²⁸ Ref. 21, p. 9.