Indian Journal of History of Science, 39.2 (2004) 231-236

1874 Transit Observations of A. V. Narsinga Rao at Visakhapatnam

The story of observations in India, of the 18th century transits of Venus – those of 1761 and 1769, belonged to European observers who travelled to India, to observe the transits. The most poignant of these travellers was, of course, Le Gentil, who missed both the transits after traveling in difficult conditions and waiting away from the home base, all of eight years, from one transit of Venus to the next!

The 1874 Transit of Venus was visible from India. This created a lot of interest and astronomical activity among the British astronomers, already in India at that time, or European expeditions to India for the transit. This was the time when the Indian astronomers – C. Raghunathachary and Narsinga Rao (Anglicized names – C. Ragoonathachary and Nursing Rows) associated with astronomical researches related to eclipses, occultations and transits during this period made contributory observations on the event.

Chintamani Raghunathachary was an assistant to Norman Pogson, the British Government astronomer and head of the Madras Observatory from 1861 to 1891. The group's concentration was in the study of variable stars and asteroids. It also participated in observations of solar eclipses visible from India, the most important of which was the eclipse of August 18, 1868. Spectroscopic observations of this eclipse, done at Guntur, in Andhra Pradesh, gave the first indication of the existence of the element Helium, so called, because it was first detected in the Sun. Raghunathachary communicated the results of some of his eclipse observations of 1871 (submitted through Pogson) to the Monthly notices of the Royal Astronomical Society. Raghunathachary's discovery of the variability of light output from R Reticuli is considered the first observational discovery in modern astronomy by an Indian observer. He seems to have also been active towards the preparations for the observations of the 1874 Transit of Venus. He even brought out a booklet in Urdu on this aspect[1]. However he does not seem to have communicated any observations

of the transit, perhaps he had been clouded out, as seems to be indicated from some of the reports by others, of the 1874 Transit of Venus.

The other Indian name associated with observations of eclipses, transits and comets, during this period, is that of Ankitam Venkata Narsinga Rao, a scion of a zamindari family. Considering that his observations were not conducted at an observatory under the support of the British Government in India, it may be worthwhile to trace his biographical details that led to his interest in astronomy and his ability to do observations with modern European instruments and report his observations in European journals. A Monthly Notices, gives the following biographical information about Narsinga Rao:.

> 'He was born in 1827. His father was a diwan of the nawab of Masulipatam (present day Machilipatnam) and uncle a dubash of the East India Company in Ganjam district. On becoming an orphan his maternal grandfather brought him up and his education was entrusted to Mr. Porter and then to Rev. J. Hay, who is considered as the father of modern education in the northern circars. Narsinga Rao worked as a deputy collector with the East India Company, but later resigned on his wife's inheriting some property, to manage the estate'.

The property what Narsinga Rao inherited had an observatory equipped with a transit instrument, erected by his father-in-law, G. V. Jugga Rao. It was here he learnt the rudiments of astronomy and built on it, through his correspondence with English astronomers. He had a new observatory built in 1874 and equipped it with a 6 inch equatorial instrument, a transit circle and a sidereal clock. He also started a photographic laboratory in the town and wished to provide means at his observatory for astro-photography. His effort remained unfulfilled because of his death on June 18, 1892.

Narsinga Rao was elected a fellow of the Royal Astronomical Society in 1871 and the Royal Geographical Society in 1872.

One of the English astronomers he seems to have been in correspondence with, was Charles Piazzi Smyth of Edinburgh, Astronomer

Royal of Scotland and Professor at Edinburgh University. Narsinga Rao communicated his observations of the 1868 Transit of Mercury visible from India (Fig. 1), to Piazzi Smyth, who submitted these observations to the *Monthly Notices of the Royal Astronomical Society (MNRAS)*[3]. Narsinga Rao sketched the location of Mercury, as seen from Visakhapatnam, during the transit as follows:

His transit timings are:

First Contract — $10^h\ 58^m\ 39^s$

Last Contract — $2^h\ 35^m\ 57^s$

Presumably, these referred to the second and the third contacts of Mercury which calculated from the Occult program, for this transit as seen from Visakhapatnam are $10^h\ 58^m\ 47^s$. Second Contact $2^h\ 29^m\ 21^s$. A comparison of his transit path with that obtained through a simulation of the same transit, seen from Visakhapatnam, using Redshift software, is shown in Fig.2.

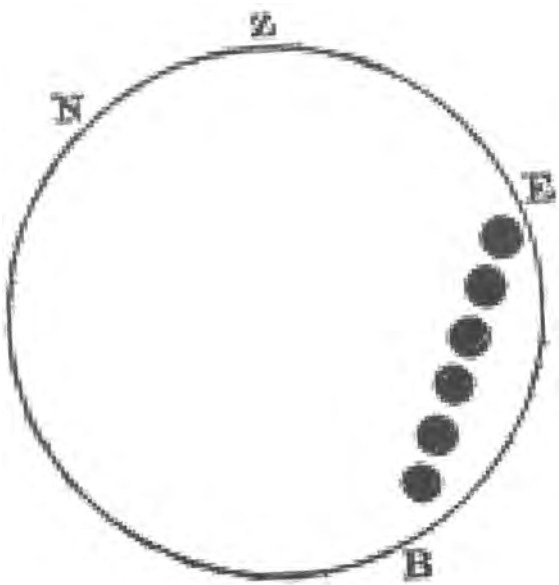

Fig. 1: Narsinga Rao's sketch of Mercury transiting the Sun, 5th November 1868. His annotations refer to Z as the vertex or the highest point of the Sun, N the north point, B the point of first contact and E the point of last contact.

He refers to the observation of a 'wavy tint of light darting from the upper edge, disturbed at times, but continued until the planet had passed some distance from the highest point of the line of transit' by himself and some European friends present during the observation. Suspecting this to be an effect of disturbed focus, Narsinga Rao readjusted the focus, changed eyepieces and took several other precautions, but the phenomenon survived in spite of all this. Narsinga Rao goes on to state: 'A scientific friend who was then present remarked to me that he was informed somewhere that the planet, when leaving the Sun's disk, would have the appearance of a flask'. By this, he presumably was referring to the blackdrop effect, and seems to have watched out for it and not detected it from his observations.

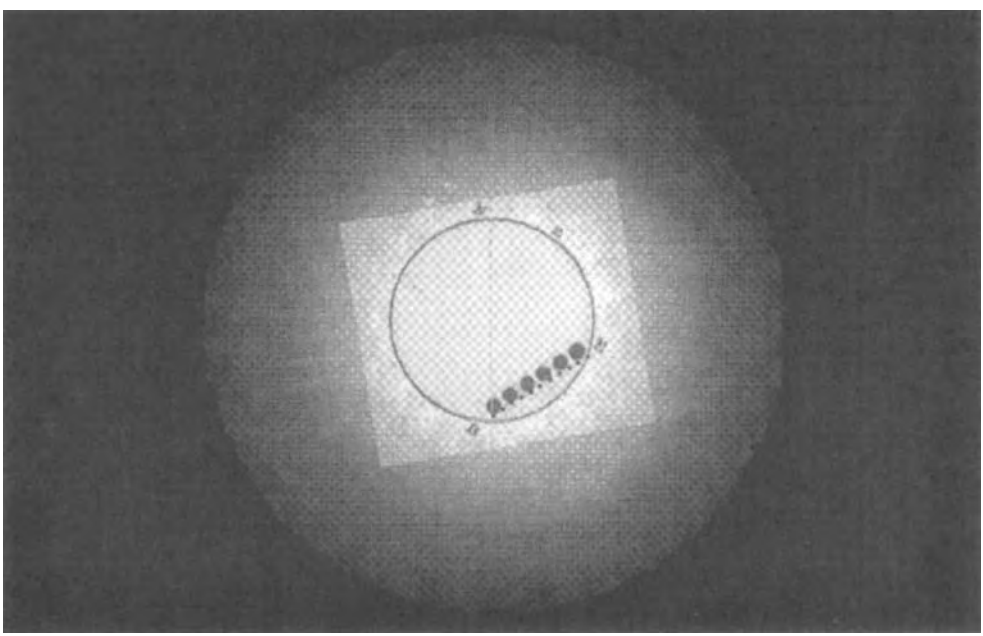

Fig. 2. A comparison of the Mercury transit path noted by Nursing Row (black dots) with a simulated path (pink dots).

Piazzi Smyth then comments on these observation and the observer:

> 'The writer of the above extract is a hindoo gentleman of Vizagapatnam, whose family has been much given to science through two generations. He possesses an extensive observatory, both Astronomical and Meteorological and is now about to add to the former with a 6 inch equatorial, with driving clock, micrometer and spectroscope, and to his library all the purchaseable volumes of the *Monthly Notices of the Royal Astronomical Society*. The telescope with which these observations were made has an object glass of 4.28 inches aperture, by the late W. S. Jones, of London and was fitted up in Mr. Nursing Row's own workshop on a large and original kind of altazimuth stand, supplied with vernier circles, levels and slow motion screw-movements'.

The geographical location of Daba Gardens[4], Visakhapatnam, where Narsinga Rao, observatory was situated, was given by him in a note about the solar eclipse of 1872, to Dr. Huggins, as 17° 42′ 9″ N and 83° 22′ 30″ E.

The instruments mentioned above were obtained and used by Narsinga Rao, for the observations of the 1874 Transit of Venus, the results of which he communicated directly to the *Monthly Notices* [5]. The weather was favourable only for the last thirty minutes of the transit, and he succeeded only in observing the egress. He reports the observed timings in sidereal time as:

Second Internal Contact	– $16^h\ 47^m\ 15.4^s$
Second External Contract	— $17^h\ 15^m 27.2^s$

The predicted times from Occult, for Visakhapatnam, on the 9th of December 1874, are (in sidereal time).

Second Internal Contact	– $16^h\ 19^m\ 28^s$
Second External Contract	— $16^h\ 32^m\ 49^s$

Narsinga Rao also refers to an indentation observed on the Sun after the Fourth Contact:

> 'After the second external contact, when the limb of the Sun had resumed its natural appearance of an arc, a slight indentation was directly formed in the Sun's limb. This indentation was not so dense as that caused by the planet, but was more or less tending towards an ash colour, and was apparently greater in arc than the pervious one'.

He gives the timings for the disappearance of the indentation as $17^h\ 15^m\ 54^s$ (sidereal time). This indentation could have been a manifestation of the atmosphere of Venus, and it would be interesting to compare the noticing of this with other observations, related to the atmosphere of Venus. Later, Narsinga Rao also made observations of the great comet[6] of 1882 and comet Pons-Brooke[7].

It is a great pity that one can find at the present moment little remains of the observatory and the indigenous observing efforts of Ankitam Venkata Narsinga Rao other than his publications and some of his instruments displayed at the Visakhapatnam Museum.

References

1. Kochar, Rajesh and Jayant, Narlikar, *Astronomy in India – Past, Present and Future*, Published by IUCAA, Pune, 1993.
2. Obituary, *MNRAS,* 53(1893) 222.
3. Nursing Row, *MNRAS*, 29(1869) 278.
4. Huggins, *MNRAS*, 32(1872) 72.
5. Nursing Row, *MNRAS*, 35(1875) 317.
6. Nursing Row, *MNRAS,* 43(1882) 32.
7. Nursing Row, *MNRAS*, 44(1884) 255.

N. Rathnasree and Sanat Kumar
Nehru Planetarium, New Delhi