

The C41/ICHA Transits of Venus Working Group. 2: Lord Lindsay's Transit of Venus expedition to Mauritius 1874

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Of the many expeditions that set out from Britain to observe the Transit of Venus in 1874, that organized by Lord (James Ludovic) Lindsay (later Earl of Crawford) from the Dun Echt Observatory in Scotland to the island of Mauritius was unique in certain respects: it was privately funded, and it carried out an independent and in part experimental programme of observation.

Dun Echt Observatory, which functioned from 1872-92 on the country estate of the Crawford family near Aberdeen, was the dream creation of Lindsay, a talented independent astronomer of professional standing. Lindsay's immediate ambition, when he began to plan his observatory in 1872, was to observe the approaching transit of Venus, and preparations for the Transit went hand in hand with the refurbishing of the new observatory. He recruited the brilliant and enthusiastic David Gill, and together they set about acquiring a variety of instruments, with particular reference to the needs of the Transit. They decided that their principal instrument for that event should be a heliometer, the favoured instrument of the official German and Russian expeditions. Lindsay's expedition also made provision to contribute by the photographic method, and was equipped with much auxiliary apparatus, including a transit instrument, chronometers, and photographic materials.

The site on Mauritius was provided by a resident of the island, Eduard de Chazal, on his estate of Belmont, sixteen miles from Port Louis (latitude 20° S). The scientific team consisted of Lord Lindsay, David Gill, Ralph Copeland, on leave from Dunsink Observatory, and Lord Lindsay's photographer Henry Davis. A horizontally-mounted telescope of 40 feet focal length was employed to photograph the transit, while Gill was responsible for using the heliometer in the manner adopted by the German astronomers. The transit, on 1874 December 9, was observed according to plan. The data were reduced and pooled with those of the other British expeditions but not separately published. As with other expeditions world-wide, the results were disappointing.

The real significance of the Mauritius expedition lay in Gill's second heliometer programme. It consisted in observing the minor planet Juno, which was in opposition one month previously, on November 5, for the purpose of deriving the solar parallax by the diurnal method. Gill, who had travelled in advance with the bulk of the expedition's equipment, was installed in Mauritius in good time, but the heliometer, which was transported by Lindsay in his yacht, unfortunately arrived late. Gill's observations began only on November 12, continuing until November 30. The span was enough, however, to provide a good result and to establish the method.

The diurnal method of observing the parallax of a planet, and hence of the Sun, had been

suggested as far back as 1857 by G B Airy, but had not previously been put into practice. Instead of observing the planet from widely-separated positions on the surface of Earth, the astronomer observes it from the same location after an interval of time, allowing the rotation of Earth to provide the baseline for parallax. This requires to be done when the planet is in opposition, the observations being made in the evening and again in the morning. The idea of using a minor planet for parallax work instead of the nearest planets, Mars and Venus, originated with J G Galle in 1872, who pointed out that a minor planet, though more distant, had the advantage of a star-like appearance, allowing its position to be more precisely determined. He tried the method with the minor planet Flora at its opposition in 1873 October, with the co-operation of a number of observatories throughout the world, including Dun Echt. Gill's procedure was thus original, in that it combined for the first time the diurnal method with the use of a minor planet, and furthermore, used – unusually – the heliometer for the observations. The resulting solar parallax (8".77) was published in 1877 (Lindsay and Gill, 1877).

The Juno work on Mauritius confirmed the advantages of the diurnal method of parallax determination, and of minor planets for parallax purposes. It also, as far as Gill was concerned, sealed his preference for the heliometer as a positional instrument. It was the springboard for Gill's successful observations of Mars (again with Lindsay's heliometer) at opposition in 1877, and his subsequent important series of collaborative observations of minor planets, leading to improved values of the solar parallax (listed by Hughes, 2001).

An account of Lord Lindsay's Transit of Venus expedition is included in Brück's history of Dun Echt Observatory (Brück, 1992). Lord Lindsay's historic heliometer is preserved at the Royal Observatory Edinburgh.

Lord Lindsay has recorded that the site of the Transit of Venus instruments at Belmont on Mauritius was given by the owner as a gift to the Government for preservation. The present writer does not know if the site is still marked, but would like to draw it to the attention of the Working Group.

The site of the Dun Echt Observatory is marked by an engraved stone, placed there by the 26th Earl of Crawford (formerly Lord Lindsay) in 1892.

REFERENCES

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