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Revealing observatory networks through object stories: Object itineraries

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Abstract

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In this paper, each contribution uses an object biography – or object itinerary – methodology, tracking their chosen objects from conception and purchase, across time and space, to today. The function of each object could change significantly over time, and these stories serve to remind us of the range of projects and activities that observatories might support or host, including overseas astronomical expeditions, a local time service, mathematical calculations, measurement of photographic plates, magnetic, meteorological and seismological observation, the hosting and dining of visitors, and the display and promotion of the observatory's status. In each case, the object's movements and location within particular spaces point the reader to consider a wide range of people, whether located within the observatory, beyond its walls, or within international scientific networks. The objects considered here are a London-made marine chronometer purchased by the Palermo Observatory, which was not used for navigation but was nevertheless well travelled; a large wooden table placed in the Octagon Room of the Royal Observatory Greenwich; and a British seismograph set up in at the Meteorological and Magnetic Observatory of the University of Coimbra. These itineraries also show how the value attached to objects changes over time: they shift from functional tools to obsolescence, then regain significance as their histories have been recovered and re-examined. This paper forms part of the collection 'Revealing observatory networks through object stories' where object stories are presented in three themed papers (with further papers being 'Instrumental networks' and 'Observatory audiences'). The genesis of the collection is described in the 'Introduction'.

Keywords

astronomical expeditions, astronomy, chronometer, human computers, meteorological and magnetic observatory, object biography, object itineraries, object stories, observational data, observatory furniture, observatory sites, Palermo Astronomical Observatory, Royal Observatory Greenwich, seismograph, Seismology, timekeeping, University of Coimbra

1. A travelling chronometer, by Ileana Chinnici

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Introduction

A Whiffin chronometer is currently held at the Museo della Specola in Palermo. It is part of a small collection of marine chronometers that were acquired by the Palermo Astronomical Observatory during its more than two centuries of scientific activity. It is, of course, an instrument built for travel, and telling its story makes us, too, travel through time and space. Its 'biography' tells us about the mobility of instruments and astronomy. This article describes the circumstances in which it was purchased and the various scientific expeditions on which it was used.

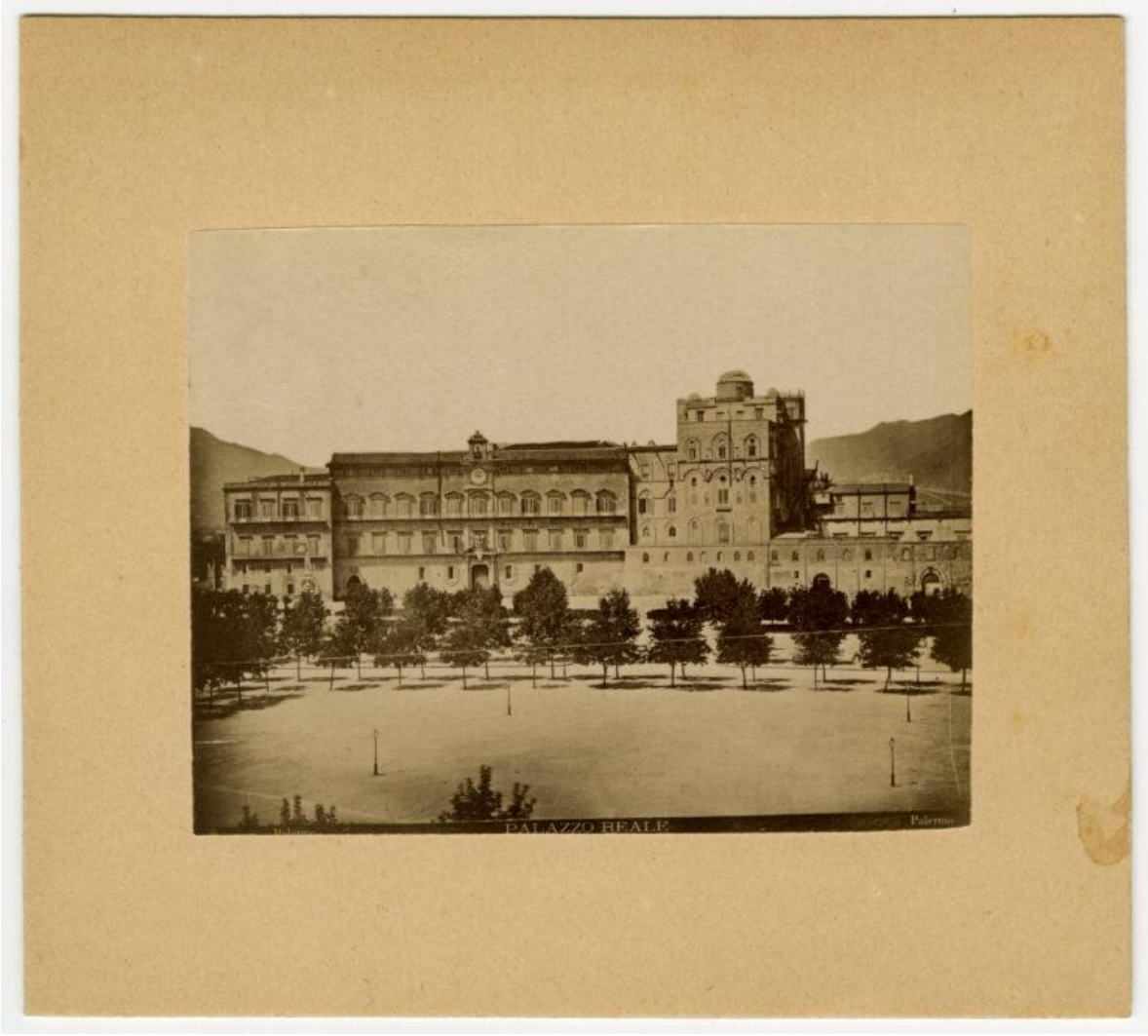

Figure 1 : The Royal Palace with the Palermo Astronomical Observatory (on the right) at the end of the nineteenth century
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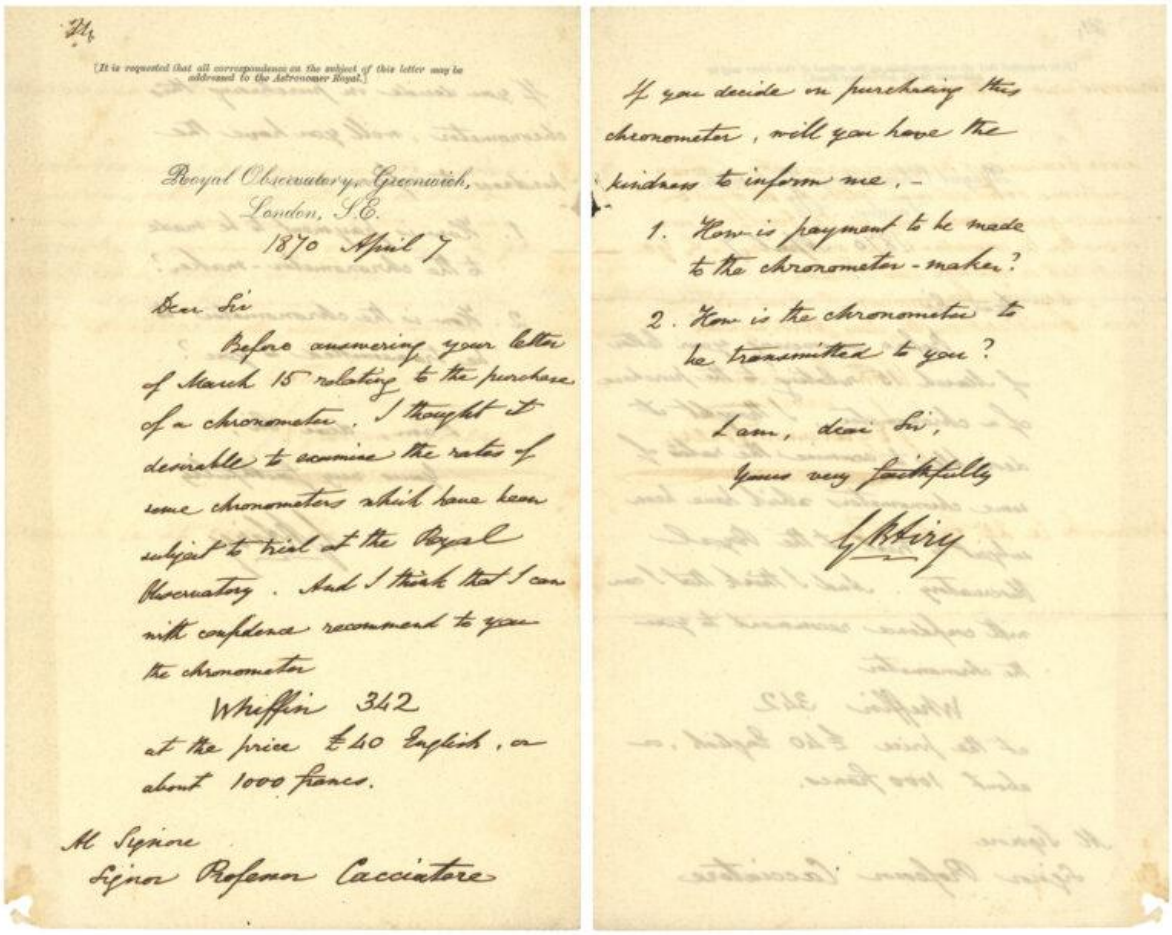
On 22 December 1870, a total solar eclipse was visible from south-eastern Sicily. The Italian government appointed a commission to organise a scientific expedition for observing the phenomenon. Expectations were high because, during the preceding total solar eclipse of 1869, a green emission line had for the first time been observed in the spectrum of the solar corona – an observation which needed to be confirmed. Naturally, astronomers from Palermo Astronomical Observatory were charged with the main preparations, including choice of the station(s), acquisition of appropriate equipment and recruitment of staff (Olostro Cirella, E and Gargano, M, 2016, pp 58–64).

The standard equipment essentially consisted of instruments for astronomical observations, time determination, and measurement of meteorological parameters. In addition, however, instruments for spectroscopic and polarimetric observations, devices for measurements of solar radiation and geomagnetic variation and photographic apparatus were regularly used, especially after 1860. Time measurement was the most important operation to be done before, during and after the eclipse, in order to have an accurate determination of the instants of the contacts and ensure that the observations were comparable to the others. Consequently, having reliable chronometers was crucial.

At the time of its foundation, around the end of the eighteenth century, most of the clocks of the Palermo Astronomical Observatory were made in London. British clockmakers were still leaders in the construction of astronomical pendulums and chronometers in the nineteenth century and director Gaetano Cacciatore (1814–89) decided to follow the steps of his predecessors. On 15 March 1870, he wrote to the British Astronomer Royal, George B Airy, to ask for his advice on purchasing a reliable chronometer for the Observatory to be used during the expedition. Airy, who in 1840 had resumed the service of testing English clocks at the Royal Observatory of Greenwich (Dolan, 2014–23), replied:

> ...before answering your letter of March 15 relating to the purchase of a chronometer, I thought it desirable to examine the rates of some chronometers which have been subject to trial at the Royal Observatory. And I think that I can with confidence recommend to you the chronometer Whiffin 342 at the price of £40 English, or about 1000 francs.

> If you decide on purchasing this chronometer, will you have the kindness to inform me, – 1. How is payment to be made to the chronometer-maker? 2. How is the chronometer to be transmitted to you?[1]



[It is requested that all correspondence on the subject of this letter may be addressed to the Astronomer Royal.]

Royal Observatory, Greenwich,
London, S.E.
1870 April 7

Dear Sir

Before answering your letter of March 15 relating to the purchase of a chronometer, I thought it desirable to examine the rates of some chronometers which have been subject to trial at the Royal Observatory. And I think that I can with confidence recommend to you the chronometer

Whiffin 342

at the price £40 English, or about 1000 francs.

M Signore
Signor Professor Cacciatore

If you decide on purchasing this chronometer, will you have the kindness to inform me, –

1. How is payment to be made to the chronometer-maker?

2. How is the chronometer to be transmitted to you?

I am, dear Sir,
Yours very faithfully
G B Airy

Figure 2 : Letter from G B Airy to G Cacciatore, 7 April 1870
© *INAF Osservatorio Astronomico di Palermo*
https://dx.doi.org/10.15180/232005/006

Swann Whiffin (1822–74) was a chronometer maker who worked in London and mainly produced marine chronometers.[2] This kind of chronometer, being sufficiently accurate and easy to transport, was ideal for scientific expeditions. Cacciatore, relying on Airy's advice, purchased the Whiffin No. 342 chronometer. For his part, Airy was so convinced of the good quality of the instrument that he interrupted its trial in order to sell it to Cacciatore: it was 'withdrawn by the maker, by permission' (Airy, 1871a, p 3).

Figure 3 : (left) The Whiffin No. 342 chronometer, Museo della Specola; (right) detail of the chronometer

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Transport to Sicily

The chronometer thus started its first journey. Whiffin wrote to Cacciatore:

> A Chronometer made by me, which for the last four months has been on trial at the Royal Observatory Greenwich, and purchased on your behalf by Professor Airey [sic], was last week entrusted to Captain Robinson of the Brig "Emily" to be conveyed by him to Marsala. I should think its chief risk would be on the transit from Marsala to Palermo. If so, I believe consigned to Mess.^{rs} Whittaker [sic] Merchants. Could you take any precaution for its security[?]

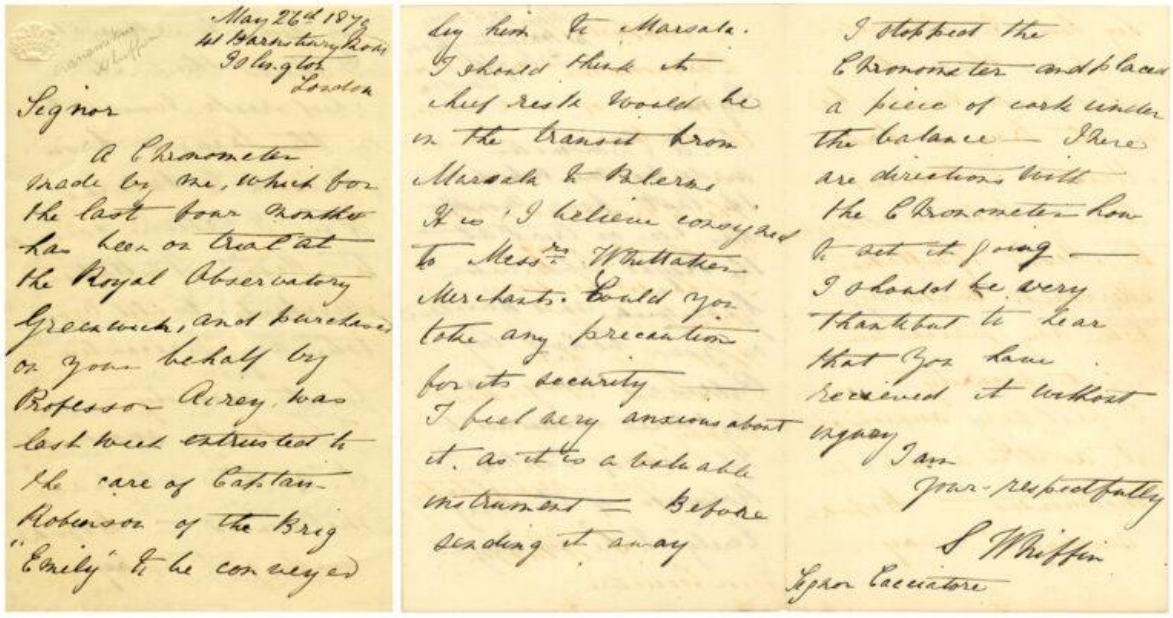

Figure 4 : Letter by Whiffin to Cacciatore, 26 May 1870
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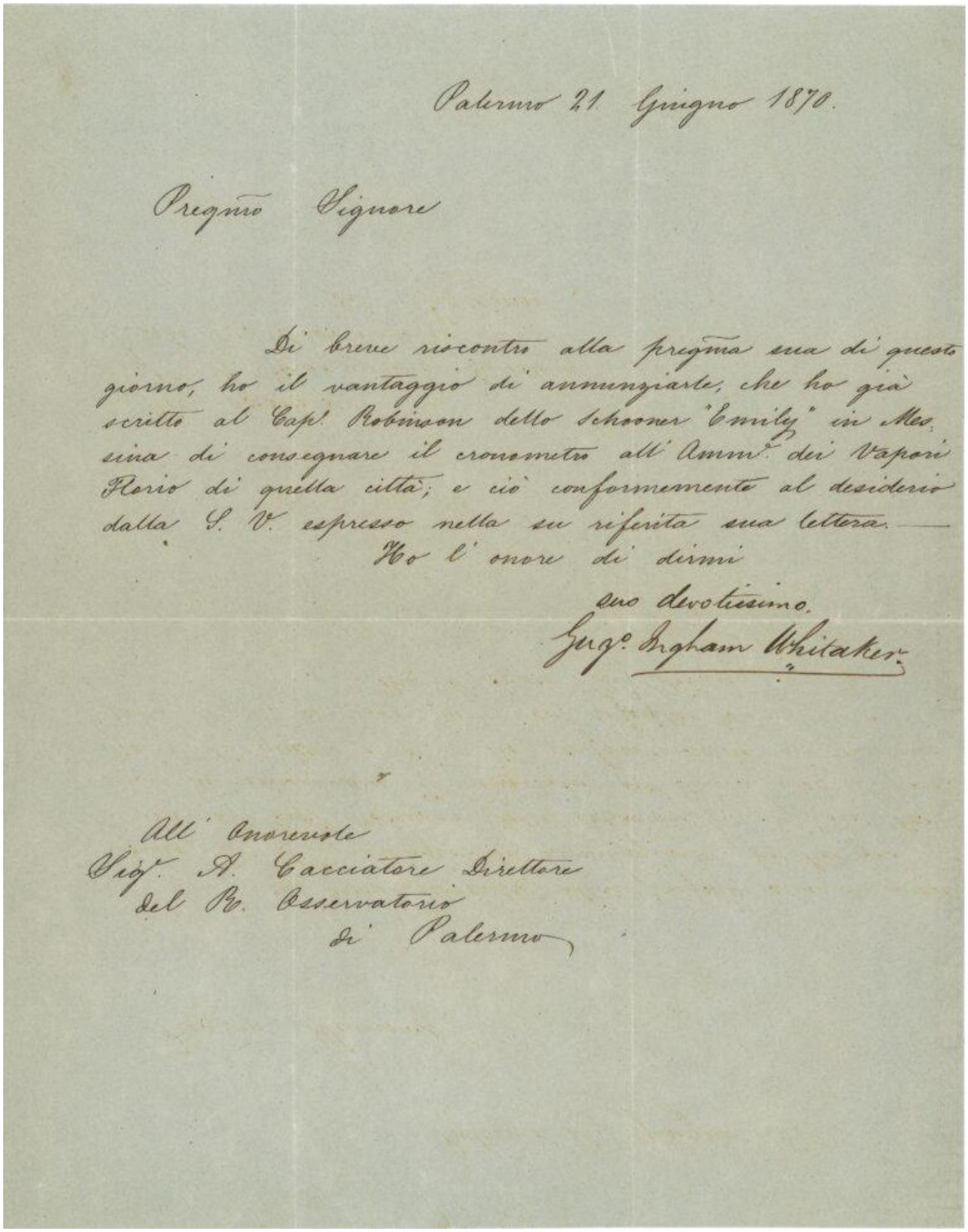
https://dx.doi.org/10.15180/232005/008

Whiffin had chosen to make use of pre-existing political and commercial links between Britain and Sicily. The best and fastest way to travel between the two was to follow the well-established route of wine, in place since wealthy English families had become producers and merchants of Sicilian wine in the first half of the century. A renowned wine factory was established in Marsala by Benjamin Ingham – cloth merchant and banker in Palermo – and his nephew Joseph Whitaker (AMSP, 1985). The Ingham-Whitaker family had a small commercial fleet which sailed both the Atlantic and the Pacific. In 1840 a young friend of theirs, Vincenzo Florio, joined with Ingham to establish an innovative and efficient steamboat company (also for trade in sulphur products), which gained an excellent reputation for almost a century. Thus, the chronometer was shipped on board a brig of the Ingham-Whitaker fleet.

Despite the experience of wine merchants in dealing with expensive and fragile cargo, and the fact that chronometers were made to travel, Whiffin's concern was clear. 'I feel very anxious about it', he wrote, 'as it is a valuable instrument.' He took care in packing, noting that 'Before sending it away I stopped the Chronometer and placed a piece of cork under the balance', providing instructions for how to set it going again. 'I should be very thankful to h at you have received it without injury.'[3]

Cacciatore also knew a reliable connection to minimize risk of damage or loss. Once the *Emily* had reached Messina – the first stop in a Sicilian port – it could be shipped onboard a steamboat of the Florio fleet, sailing to Palermo. He thus wrote to William Ingham Whitaker, son of Joseph Whitaker and company administrator, who reassured him: 'I have already written to Capt[ain] Robinson of the Schooner "Emily" in Messina, asking him to deliver the chronometer to the Adm[iral] of the Florio steamboats of that town, as you requested.'[4]



Palermo 21 Giugno 1870.

Pregmo Signore

Di breve riscontro alla pregma sua di questo giorno, ho il vantaggio di annunziarle, che ho già scritto al Capt Robinson dello schooner "Emily" in Mes. sina di consegnare il cronometro all' Amm.e dei Vapori Florio di quella città; e ciò conformemente al desiderio dalla S. V. espresso nella su riferita sua lettera. —

Ho l' onore di dirmi

suo devotissimo.

Jurg.e Ingham Whitaker

All' Onorevole
Sig.r A. Cacciatore Direttore
del R. Osservatorio
di Palermo

Figure 5 : Letter by Guglielmo (William) Ingham Whitaker to Gaetano Cacciatore

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On 12 July, the chronometer was in Palermo. Pietro Tacchini (1838–190[illegible]int astronomer to Palermo Observatory, was informed about delivery and payment

details:

> We are pleased to inform you that the Chronometer ordered by you through the agency of Mr. William Ingham Whitaker has arrived. We would be grateful if you would now send someone to collect it… The cost of the Chronometer, as you will have been informed, is £ 40, that at the exchange rate of 26 comes to 1,040 Italian lire which you can pay to us with the addition of 85 cents for our minor expenses.[5]

Whiffin 342 on expedition

It is unclear if the chronometer was left packed until the departure of the expedition in November, as no mention has been found about tests at Palermo Observatory. In any case, its final destination was Augusta, on the eastern coast of Sicily, where an astronomical station was built for the purpose of observing the eclipse. Along with other instruments forming the expedition equipment, Whiffin 342 was again shipped, this time onboard a steam corvette of the Italian navy, the *Plebiscito*, to be transported to Augusta (Cacciatore, 1872, pp 4–5). Something, however, went wrong. Other marine chronometers, on loan from other Italian observatories, were used for the time determination and, by comparing their rates, it was evident that time measurements taken with the Whiffin chronometer had to be discarded:

> …the Whiffin chronometer…was later recognised as unsuitable, because it showed variations and highly irregular jumps when it was moved from one place to another, perhaps as a result of damage sustained during the journey (Cacciatore, 1872, p 36).[6]

Nevertheless, the chronometer was not discarded. Though no evidence has been found, it is highly probable that it was repaired, because four years later it was used for another scientific expedition.

Figure 6 : The scientists in Augusta, with local authorities

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On 9 December 1874 a transit of Venus across the Sun's disc was visible from many regions of Asia and Australia. This rare phenomenon provides an extraordinary opportunity for accurate measurements of solar parallax, from which the Earth-Sun distance can be trigonometrically derived if observed from at least two, and ideally multiple, stations at a distance from each other. The Italian government lacked the means to support many expeditions and so Tacchini proposed just one, with a special purpose: to observe the transit spectroscopically for the first time. This was an attempt to gain a clearer view of the crucial moments of 'contact', when Venus appeared to touch the solar limb, in order to compare the measurements of the solar disk's diameter obtained by ordinary and by spectroscopic observations. An accurate determination of their difference would provide important information about the extension and nature of the outer solar atmosphere.

Following the suggestion of Arthur Auwers, director of Berlin Observatory, the small Italian party headed by Tacchini (a mechanic, one amateur and three professional astronomers) chose to observe the phenomenon from Bengal, in Muddapur (today Madhupur), near Calcutta. Tacchini brought Whiffin 342 from Palermo Observatory for time determination, as well as a Dent chronometer on loan from the private observatory of Marquis Raimondo Montecuccoli in Modena.

Mindful of the irregular rates that the chronometer had shown in Augusta, before the departure to Bengal, Tacchini asked to test it at Padua Observatory (Abetti, 1875, p 50), where all the equipment to be sent to India was stored. The chronometer worked with the required regularity. Together with the rest of the equipment (about seventy crates) and the observing party, it was shipped on the *Sumatra*, a steamboat of the English Peninsular and Oriental Company, sailing directly from Venice to Calcutta. The journey was quite troubled. Due to the failure of the steamboat's propeller at Alexandria in Egypt, the party reached Suez by railway to meet the *Surat*, a steamboat bound for Calcutta, which unfortunately was late. Tacchini then decided to change plans and, without waiting the arrival of the *Surat*, opted to ship men and instruments onboard the steamboat *Ceylon*, destined for Bombay via Aden. Once in Bombay, the crates were landed and three of them got broken, fortunately those containing materials for building the barracks for the astronomical station. Thanks to the assistance of the local Italian Consul, the baggage was loaded onto the carriages and the party left by railways for Muddapur via Allahabad.

Figure 7 : Tacchini preparing the instruments in Muddapur

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The Whiffin chronometer was used for local time determination (Muddapur Mean Time). Tacchini had previously contacted Norman R Pogson, astronomer in Madras, who agreed to assist the Italian party in the telegraphic determination of the longitude of Muddapur. Whiffin 342 was used to measure the time interval of 10 seconds of a first series of intermittent telegraphic signals sent from Muddapur to Madras for about 15 minutes. Pogson replied with a similar series of signals from Madras. The same operation was repeated from Muddapur with the Dent chronometer. All time signals were recorded in both stations and, from their comparison, after local time corrections and telegraphic signals later sent from Calcutta, the difference of longitude between Madras and Muddapur was determined (Tacchini, 1875b, pp 87–88).[7] These observations were essential for the processes of correcting the transit observations and comparing them with others made around the world.

Both chronometers (Whiffin and Dent), however, ran irregularly. This was evident after the time determination by astronomical observation was completed by Antonio Abetti, who calculated the corrections of the chronometers. He explained the irregular running was 'mostly due to the strong variations of temperature which are inevitable in places only sheltered by canvas' (Abetti, 1875, pp 50–51).

A few months later, the Whiffin chronometer had to render other services to science. While in Bengal, Tacchini was invited by the Royal Society to participate in the English expedition to the Nicobar Islands for observing and making spectroscopic observations of the total solar eclipse of 6 April 1875 (Waterhouse, 1875, p 6). The Italian party separated. While the others went back to Italy, Tacchini, with the mechanic Antonio Cagnato from Padua Observatory as his assistant, joined the English expedition. Tacchini brought the Whiffin chronometer. The expedition was divided into different groups and Tacchini was the only astronomer of the party settled at Camorta; he was therefore in charge of calculating the time of the contacts and gave assistance to setting up the instruments (Waterhouse, 1875, pp 7, 16). The Whiffin chronometer was used for measuring the time of the contacts (Tacchini, 1875a, pp 22–24).

Figure 8 : The astronomical station at Camorta, Nicobar Islands, in Waterhouse, [illegible], frontispiece © *British Library via GoogleBooks*

https://dx.doi.org/10.15180/232005/012

Once back to Palermo, the chronometer was still used at the Observatory, as it is mentioned among the main instruments in use ('*principali strumenti in esercizio*') in a report by Cacciatore (1882, p x).

It is unclear if it was also brought to Russia by Annibale Riccò, astronomer at Palermo Observatory, who went to observe the total solar eclipse of 19 August 1887 in the small village of Surwiskaja, together with Tacchini. In the latter's report, the only instruments which he mentions are telescopes (Tacchini, 1888, p 211), but it is obvious that a chronometer would be included in the essential equipment that they brought from Italy.

A few years later, the instrument was certainly used for determining the time of the contacts during observations of the solar eclipse of 17 June 1890, made at Palermo Observatory and coordinated by Riccò (Riccò, 1891, p 122).

Whiffin 342 in Palermo Observatory

Back at the Observatory, Whiffin 342 played an important role. A report published in 1904 by director Filippo Angelitti stated that 'An excellent marine chronometer, with half-second steps, made by Whiffin, No. 342, is regulated to mean time and is used for the noon signal' (Angelitti, 1904, p 34).[8] It was, in other words, being used for the city's time service, one of the most important tasks of astronomical observatories.

About forty years after its acquisition, therefore, the Whiffin chronometer was still in use and regulating a crucial service. For this reason, it probably stopped travelling. In the report of the scientific expedition to Sfax for observing the total solar eclipse of 30 August 1905, Temistocle Zona, an astronomer from Palermo Observatory, did not mention any chronometer in the equipment (Zona, 1908). It is unlikely that none was included, but other chronometers were available at that time at the Observatory and were probably preferred to the old one.

The Whiffin chronometer is now 'retired' and at rest in the Museum of the Palermo Observatory, together with two other marine chronometers, made by McGregor and Nardin. Kept for its historic value, it is well preserved and equipped with its padded wooden travel box, seeming ready to travel once more

in the interest of science. It is decidedly the instrument of the Observatory that has travelled the most and today it illustrates the connections between instrument makers and astronomers in different countries, and between commercial and scientific networks. It also underscores the essential role of timekeeping in allowing astronomy to be carried out globally.


S.WHIFFIN.
12.542.

Figure 9 : The Whiffin chronometer inside its travel box
© Museo della Specola, INAF Osservatorio Astronomico di Palermo & Università di Palermo, Sistema Museale di Ateneo
https://dx.doi.org/10.15180/232005/013

2. Invisible support: the Octagon Room table of the Royal Observatory, Greenwich, by Louise E Devoy

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Introduction

> **part of the furniture**, something familiar enough to be regarded as a permanent feature (and therefore taken for granted). *colloquial*.
>
> *Oxford English Dictionary*

The purpose of this study is to trace the object itinerary of an item that had no direct astronomical use but was a key part of the Royal Observatory's administrative infrastructure that facilitated networking events with both professional and public visitors. The object of study is a long, multi-sectioned table with oval ends that was used in the Octagon Room within Flamsteed House, the oldest part of the Observatory site. Made in the nineteenth century, it is the only surviving piece of observatory furniture within the collections and is currently held in storage.[9] With no distinguishing features and few archival sources, we can only infer its object itinerary alongside the changing functions of the Octagon Room, from meeting room to computing space and social venue. Unlike the other objects described in this issue, the Octagon Room table did not travel along networks (cf. Chinnici in 'Object itineraries'), was not used for public spectacle (cf. Raposo, 'Observatory audiences') and did not help promote the Observatory across international networks as a recommended instrument (cf. Figueiredo,'Object itineraries' and; Biro,'Observatory audiences'). Yet the very nature of its invisibility makes it worthy of study as an opportunity to examine the mundane material culture of the Observatory's working environment, beyond its famous clocks and telescopes.

Description of the table

Made of quarter-sawn oak for maximum stability, the table is composed of two oval end sections and seven rectangular leaves for the centre section (Figure 1).