

The publication of the astronomical observations of Buenaventura Suárez SJ (1679–1750) in European scientific journals

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Abstract

Many of the observations of Buenaventura Suárez (1679-1750), a Jesuit astronomer who worked in the missions of Paraguay, were made known in prestigious contemporary scientific European periodicals such as the *Acta Societatis Regiae Scientiarum Upsalensis* and the *Philosophical Transactions of the Royal Society*. Suárez recorded lunar and solar eclipses, and immersions and emersions of the satellites of Jupiter for the purpose of determining the longitude of the mission towns he lived in. He was able to keep abreast of the state of the field and communicate his results through the intermediacy of an epistolary net with correspondents in Europe and the New World.

Keywords: *Buenaventura Suárez, Jesuit astronomy, early Latin American astronomy, Royal Society, Wargentin.*

1 INTRODUCTION

In a recent paper Troche-Boggino (2000) surveyed the life and work of the astronomer Buenaventura Suárez SJ (1679-1750), who was born in Santa Fe (present-day Argentina) and was active in the Jesuit mission towns of historical Paraguay.¹ The main purpose of this paper is to call attention to the little-known publication of Suárez's observations in the *Philosophical Transactions of the Royal Society*. We will also discuss the contemporary diffusion of his work by way of his European correspondents.

2 SUÁREZ'S DATA IN THE *ACTA SOCIETATIS REGIAE SCIENTIARUM UPSALIENSIS*

One of Suárez's achievements was the observation of 147 Jovian satellite eclipses, carried out over a thirteen-year period while he lived in the mission town of San Cosme (in present-day Paraguay). The observations were made with a number of refractors that he built himself. Suárez (1748, Introduction) states that he sent his Jovian eclipse data to the Jesuit astronomer Nicasius Grammatici (1684-1736). When the Swedish astronomer Pehr Wilhelm Wargentin (1717-83) published his second *Mémoire* on the first satellite of Jupiter in 1748 he used observations made at different locations around Earth between 1668 and 1742. In a table, Wargentin included 43 observations made by Suárez between 1720 February 10 and 1726 December 23, and he remarked that Suárez's data were "... not only outstanding, but also beautifully consistent." (Wargentin, 1748:5). Wargentin took care to mention that he got these results from Celsius, who in turn had obtained them in the course of his travels through the Continent. Celsius had also secured some of Grammatici's own observations through the intermediacy of Christfried Kirch, Johann Doppelmayr, and Eustachio Manfredi (ibid.). Although Wargentin does not explicitly say so, it is likely that Suárez's data originally came into Celsius's hands via Grammatici. It has been claimed by Caraman (2001) that Suárez corresponded with Ignaz Kögler SJ in Beijing and Joseph-Nicolas Delisle in St Petersburg, but Suárez (1748) explicitly affirms in his book, *Lunario de un Siglo*, that the data from Kögler and Delisle were communicated to him by Grammatici, along with the latter's own observations from Amberg and Madrid. Suárez used this information to calculate the longitude of San Cosme

(321° 45'), based on the meridian passing through the Isla de Hierro in the Canary Islands. Since Delisle arrived in St Petersburg in 1725 and began communicating his Jovian satellite observations in 1726 (Delisle, 1728), it is evident that Suárez's figure for the latitude of San Cosme was obtained during the second half of the 1720s.

3 THE PAPERS IN THE *PHILOSOPHICAL TRANSACTIONS OF THE ROYAL SOCIETY (OF LONDON)*

In 1725-26, while he was teaching in Ingolstadt, Grammatici published the *Planetolabium Novum*, a two-part work based on the Copernican heliocentric system. In 1726 he also compiled lunar tables that could be used to predict eclipses on the basis of Newton's theory of the Moon (Sommervogel, 1890-1900). The 1750 *Littera Annua* of the Society of Jesus for the province of Paraguay (an annual register of the activities of Jesuits in a given region) attributes to Suárez the translation into Spanish of Sarmiento's treatise on the Newtonian theory of tides (cited in Furlong, 1929:139). This work was the *Theorica Verdadeira das Marés* (Lisbon, 1737) by Jacob de Castro Sarmiento (1692-1762), a Jewish Portuguese physician who escaped persecution by emigrating to London where he was admitted to the College of Physicians. Afterwards he obtained an MD at Aberdeen, and in 1730 he joined the Royal Society (Stephen, 1967-1968). Castro Sarmiento was one of the first to introduce Newton's theories in Portugal, but his *Theorica* was mostly based upon Edmond Halley's 1696 paper in the *Philosophical Transactions* (Carvalho, J. de, 1936; Castro Moreira, 1987; Halley, 1696). It could well be the case that Suárez first became interested in Newton's theory through his early relationship with Grammatici.

While Suárez's Jovian satellite data from 1720-26 were used and published by Wargentin, some of his lunar eclipse, Jovian satellite, and other observations obtained over a longer period were communicated by Castro Sarmiento to the Royal Society (of London) and published in their *Philosophical Transactions* in 1748 (and as far as I know, this was first mentioned in Carvalho, R. de, 1955:259). This paper describes a series of observations made from 1706 through 1730, and is in two parts; one deals with lunar and solar eclipses, and the other with eclipses of the Jovian

satellites (Castro Sarmiento, 1748). The first group of observations report on six lunar eclipses, three solar eclipses, and an eclipse of Jupiter by the Moon, obtained during the twenty-three year period from 1706 November 5 to 1730 January 18. All of these were obtained with a five-foot refractor, except for the lunar eclipse of 1728 February 24 which was seen through a ten-foot refractor. In order to determine the progression of the umbra, Suárez used a pendulum clock (made by himself) which was accurate to a second. The eclipses were seen from different locations, corresponding to Jesuit mission towns in the region. Most of the observations were made from San Ignacio, but there are three observations from San José, San Cosme, and San Miguel Arcángel respectively. In each case Suárez indicated the longitude of the place, as calculated from the meridian of Paris. This first part of Castro Sarmiento's paper also refers to a naked-eye observation of the lunar eclipse of 1700 March 4, made when Suárez was a 21 year-old student in the Jesuit College of Corrientes (in present-day Argentina).

The second part of this 1748 paper is much longer, and deals about thirty-four immersions, emersions, and conjunctions of the satellites of Jupiter, all seen from the town of San Ignacio between 1729 January 26 and 1730 May 10 with thirteen- and eighteen- foot telescopes. These observations are arranged in three groups. The first records three observations made between 1729 December 21 and 1730 December 8, each of them compared with the corresponding data obtained by Delisle in St Petersburg.² The second group mentions ten immersions, emersions, and conjunctions of Jovian satellites seen between 1729 December 29 and 1730 April 1, to which should be added observations of Saturn's rings and an eclipse of Jupiter by the Moon. The final data-set presents twenty-one observations made by Suárez between 1729 January 26 and 1730 March 27. The paper also gives the longitude of San Ignacio with respect to St Petersburg, Paris, London, and San Cosme.

Castro Sarmiento (1749-50) also communicated a second paper to the Royal Society, although in the title it is erroneously attributed to a non-existent "D Suárez, MD" (and this, incidentally, is the reason why it has remained unnoticed until now). This paper describes two lunar eclipses, which were seen on 1747 February 24 from the mission town of San Miguel Arcángel and on 1747 August 19 from Santa María la Mayor. Both were observed with the aid of a ten and a half-foot telescope, and on each occasion Suárez registered the time to within a second when Earth's shadow reached different distinctive features on the Moon's surface. These lunar eclipse observations were far more sophisticated than any of his previous ones, so it is just possible that they were made with one of the two English telescopes that Suárez received in 1745. Counting against this supposition is the fact that neither of these instruments is described in contemporary sources as being ten and a half-foot refractors (see Furlong, 1945:62-68).

4 THE PORTUGUESE CONNECTION

The fact that Castro Sarmiento communicated Suárez's data to the *Philosophical Transactions* while Suárez translated Castro Sarmiento's short Newtonian treatise into Spanish suggests that at the very least some kind of indirect communication existed between these two

men. In the decade of the 1720s, King John V of Portugal summoned two Italian Jesuit astronomers to his court. Giovanni Battista Carbone (1694-1750) and Domenico Capassi (1694-1736) established two observatories in Lisbon, one at the Jesuit College of Santo Antão (St Anthony) and a smaller one at the Royal Palace (Carvalho, Rómulo de, 1985:37-55). Carbone (who became a member of the Royal Society in 1729) was exceedingly active during the said decade: between 1724 and 1730 he published ten papers in the *Philosophical Transactions* on his observations of solar and lunar eclipses and Jovian satellites, and on the determination of the longitude and latitude of Lisbon. He also sent the *Philosophical Transactions* twelve groups of observations by other astronomers, among them Francesco Bianchini (Rome), Eustachio Manfredi (Bologna), Ignaz Kögler and Andrea Pereira (Pekin), and a selection from those made at Ingolstadt in 1726 (Carvalho, R. de, 1955). These were sent directly by him or through the intermediary Isaac de Sequeira Samuda (1696-1730), and later Castro Sarmiento. Samuda (who was also a London-based Portuguese Jewish physician and member of the College of Physicians and of the Royal Society). When Samuda died, his role as a link between the Jesuit astronomers in Lisbon and the Royal Society was taken up by Castro Sarmiento (Carvalho, R. de, 1955:245 and 254).

Did Suárez become in contact with Castro Sarmiento directly or through the Portuguese Jesuits at St Anthony? Suárez's obituary in the 1750 *Littera Annua* for the province of Paraguay mentions that he corresponded with people in Lima, Brazil, Ingolstadt, and London (cited in Furlong, 1945:68), which squares rather well with what we know from other sources. To begin with, Grammatici was in Ingolstadt, while it would seem that Suárez did maintained a correspondence with an astronomer in Lima—a local savant named Diego Peralta, who also made almanacs (Furlong, 1945:58). Suárez's initial contact with Castro Sarmiento in London could have been mediated through the Portuguese. The second edition of the *Lunario* was published in Lisbon in 1748, the same year in which his first paper in the *Philosophical Transactions* appeared. Besides, the person who handled the purchase of the British astronomical instruments for Suárez in 1744 was the Portuguese Jesuit Manuel Campos (1681-1758), a Professor of Mathematics and Cosmography at the College of St Anthony (Furlong, 1945:63-64). Campos had spent four years at the Spanish court as cosmographer of Philip V of Spain, and he was a natural mediator between Spaniards and Portuguese (Dinis, 2001).

What about Suárez's correspondence with Brazil? In 1730 two Jesuit astronomers who had been sent by King John V arrived in Rio de Janeiro, charged with calculating the coordinates of Colonia del Sacramento, a city on the northern bank of the River Plate (the possession of which was disputed by Spain and Portugal). One of these was Capassi, and the other was the Portuguese Diogo Soares (1684-1748). Both measured the coordinates of many locations in south-eastern Brazil, and they made several maps of the region. Capassi died in 1736, and Soares continued with the work until he too died in 1748 (Cortesão, 1958). It is conceivable that Suárez came into contact with these 'mathematical fathers' (as they were called), although it is unlikely that there would have been much exchange of information with them, for the

interests of the mission towns in Paraguay were quite different from those of the Portuguese crown.

5 CONCLUSIONS

Three conclusions can be derived from this brief account of Suárez's activities. Firstly, his observations were made from the various Jesuit missions scattered throughout the region. Though all the data from the period 1720-26 used by Wargentín came from San Cosme, the papers of the *Philosophical Transactions* show that between 1729-30 Suárez worked in San Ignacio—and there are documents that confirm that he actually was in charge of that town between 1728 and 1730 (see Furlong, 1929:86). Besides, there are isolated observations made from several other missionary towns. Secondly, Suárez was certainly one of the first Jesuits in the River Plate region to take a serious interest in Newton's theory, as suggested by his translation of Castro Sarmiento's treatise. This shows that he was not a purely observational astronomer, and that he also had an interest in theoretical matters. Thirdly, Suárez's correspondence with Grammatici allowed him to become acquainted with recent publications in the field as well as to make known his own observations. These were then published by Wargentín in the highly-respectable journal of the Swedish Academy of Science. Suárez may have been in contact with Castro Sarmiento, either directly or through the Portuguese Jesuit astronomers working at the observatory of the College of St Anthony in Lisbon. He corresponded with Peralta in Lima and it is possible that he also had some contact with the Jesuit astronomers sent by the King of Portugal to survey the southern part of Brazil.

The Royal Society eagerly sought to publish strategic information about Latin America, since Spanish policy kept a tight grip on any kind of geographical information concerning its overseas territories (Allen, 1947). It is thus only logical that publication of the data obtained by Suárez, which included the co-ordinates of a few mission towns, would find ready acceptance. We should recall that Suárez's *Lunario* went through three European editions during the eighteenth century, besides those published in Latin America (see Troche-Boggino, 2000). The myth of the 'isolated scientist' in the midst of the Paraguayan jungle has been criticized by Glick *et al.* (1975) when applied to the eighteenth-century naturalist Félix de Azara, and neither was the Jesuit Suárez in an absolutely marginal position with respect to the astronomical community of his time. On the contrary, as with most missionary-astronomers in 'exotic' lands, he managed to interact with his European colleagues through a complex network of scientific correspondents (see Harris, 1996).

6 ACKNOWLEDGEMENTS

This work is part of a larger project supported by the Consejo Nacional de Investigaciones Científicas y Técnicas (Argentina). Part of the research relating to this paper was done in the course of a two-month stay at Clare Hall (Cambridge) thanks to the generous support of Fundación Antorchas. I gratefully acknowledge the help of the following colleagues, who sent me bibliographical items (in alphabetical order): Dr Esteban Bontempi (Karolinska Institutet), Professor Michael Crowe (University of Notre Dame), Dr José Funes SJ (Vatican Observatory Group, University of Arizona), Professor Gerardo Losada (Colegio Máximo,

San Miguel), and Professor José Meirinhos (Universidade do Porto). Dr Wayne Orchiston (Anglo-Australian Observatory, Sydney) kindly improved the style of the original version of this paper.

7 NOTES

- 1 Troche-Boggino (2000) gives 1648 as Suárez's year of birth, but his birth certificate indicates that he was born on 1649 July 14 (Furlong, 1929: 81).
- 2 The Jesuit Collection of the Biblioteca Mayor of the University of Córdoba (Argentina) holds Volumes 1, 2, 5 and 6 of the *Commentarii Academiae Imperialis Scientiarum Petropolitanae*, where Delisle published his papers. These could have been the volumes actually used by Suárez.

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