PART V

PROGYMNASTICA ASTRONOMICA AMERICANA

(Title coined by Georg Marggrafe
for the intended publication of
his astronomical observations)

TRANSCRIPTION AND ENGLISH TRANSLATION OF MARGGRAFE'S ASTRONOMICAL OBSERVATIONS, MADE IN COLONIAL DUTCH BRAZIL IN THE YEARS 1638–1643

Introduction

Georg Marggrafe made important scholarly contributions to three scholarly fields: cartography, natural history and astronomy. However, his death, in 1643, prevented him from personally finalizing and publishing his results. That's why his written legacy was split into three parts at the time. Marggrafe's maps were given to the cartographic publisher Johannes Blaeu, who published these maps as four careful engravings in Caspar Barlaeus's *Rerum per octennium in Brasilia* (1647) and combined them into a large wall map the same year. About the two other fields, natural history and astronomy, Marggrafe's personal Maecenas, Johan Maurits von Nassau-Siegen, the former governor of Dutch Brazil, reported the following in one of his letters:

> [Marggrafe's] manuscripts and drawings concerning the natural history of Brasil, with the description and dimensions of this country have been given by us to Mr. de Laet, and the manuscripts relating to the astronomical observations, to Professor Gool, *in order that its content be studied at our cost, and compiled to be published* [our italics], as has partly been done.[1]

The WIC director Johannes de Laet indeed published Marggrafe's 'Historiae Rerum Naturalium Brasiliae' in 1648, as part of the elaborately illustrated folio edition *Historia Naturalis Brasiliae*. But 'Professor Gool', or Jacob Golius, never fulfilled the task imposed on him. That is to say, Golius never took the last step. Under his supervision an edited manuscript was compiled from the then available original observation books of Georg Marggrafe, a manuscript which was press-ready in the mid–1650s. This editing may have been done by Marggrafe's former roommate, the mathematician and astronomer Samuel Kechel ab Hollensteijn, who also constructed a *Planisphaerium* of the southern

1 Johan Maurits von Nassau-Siegen to the curators of Leiden University, 19 March 1655. University Library Leiden, ASF 290: "De Schriften ende teijckeningen, betreffende de natuijrlicke historie van Brasil, ende de beschrijvinge ende afmetinge der voors. Landen, sijn door ons gegeven aen den heere de Laet, Ende de Schriften, aengaende de Astronomische Observatien, aen den heere Professor Gool, ten eijnde deselve saecken op onse Costen ondersoecht, ende bij een gebracht, mochten in 't licht gegeven worden, soo als ten deele is geschied".

stars, based on Marggrafe's observations. In 1655 it was said that Kechel would be compensated by publisher Elsevier for his services.[2]

However, a publication was not realized, firstly due to Golius's remarkable intention to present the Brazilian observations in one volume together with 'other astronomical observations transmitted to him from Arabia'.[3] But the fierce quarrel that erupted in 1656 between Golius and Marggrafe's younger brother Christian over Georg's legacy certainly will not have contributed to Golius' zeal either. When in 1668, a year after Golius's death, this astronomical text from Persia finally saw the light, no one knew that originally Marggrafe's observations would be included. From Golius's estate, the press-ready manuscript came into the possession of Melchisédech Thévenot and surfaced again in Paris, at the auction of his library in 1694. The further history of this manuscript and its two copies, made at the request of the astronomer Joseph-Nicolas de L'isle, is elaborately outlined in our Volume 1, Chapter 6.

In this Volume 2, we present a transcription (with an English translation) of the best-preserved De l'Isle copy, made from the original – now lost – press-ready manuscript from Leiden. With this, the third part of Marggrafe's scholarly legacy finally will be available for other scholars, just as his Maecenas, Johan Maurits von Nassau-Siegen, had intended.

The Paris manuscript: a note about the transcription

The following concerns the text of the early eighteenth-century manuscript B 4–5 in the archives of the *Observatoire de Paris,* entitled 'Observations faites au Brésil'. This manuscript, which is bound in contemporary green coloured vellum, contains a set of 114 handwritten small folio pages. The document has been marked with three different ink stamps, bearing the texts 'Observatoire de Paris'; 'Depot des Cartes et Journaux de la Marine', and 'Observatoire Imperial'. In the inside of the book can be read: 'No 76 Dix neuf pieces cottées'.

The transcription of this manuscript is made by Oscar Matsuura, according to the principle that its content is leading. Therefore, no diplomatic method of transcription was followed (maintaining the original format, punctuation, spelling etc.), but rather the so-called critical-normal or judicial method. This means that the transcript is made as accurately as possible, maintaining its abbreviations and astronomical symbols, but with

2 Willem Piso to Jacob Gool, 12 May 1655. University Library Leiden, ASF 290: "De observatien van Markgraef sijn mijn behandigt, alsmede UEd. aengename schrijvens. welke ik Elsevier comunicerende, tot antwoort bequam, dat ik uit sijn neam wilde UE notificeren dat hij UE brief mede ontvangen hadde, en sich in alle billikheit soude laten vinden tot beloning van de moeite van doctor Kechel: niet alleen vant geen [hij] geschreven heeft, maar ook van 't afteijkenen vant Planispherium …".

3 Christian Marggrafe to Johannes Hevelius, 20 July 1652: 'Fratris mei Georgij observationes Astronomicas iam demu[m] vidi. Sunt Theoriae novae Planetarum, praecipue Mercurij, qui eo in loco, quo vixit, melius quam apud nos conspici potuit. Edentur brevi a clariss. Golio una cum alijs observationibus Astronomicus ex Arabia transmissis'. Observatoire de Paris, Hevelius correspondence.

a capitalization of names (of places and persons). Sound values are also corrected: 'U' as in 'uocant' is replaced by 'V" in 'vocant', etc.; Roman numerals in the text are translated into Arabic. In running text, the sentences are also displayed consecutively. However, the pagination of the manuscript has been maintained. The number between square brackets refers to the page number of the manuscript.

In Leiden, the archive *Erfgoed Leiden en Omstreken* (*ELO*) still preserves some of Marggrafe's original notes concerning his astronomical observations in Brazil.[4] These authentic manuscripts were evidently used to compile the edited, but lost, press-ready Leiden manuscript, of which the Paris manuscript is a neat copy. Especially important is a notebook in Marggrafe's own hand (ELO, North no. 53), containing his Brazilian observations from 15 September 1639 (when Marggrafe started to observe from the newly built observatory) until 19 June 1640. Marggrafe used this notebook to collect his draft notes of the observations. Two examples of such draft notes, hastily written down in pencil, have survived, which confirms that Marggrafe followed this procedure.[5] The last entry in this small notebook is written halfway down a page, while the Paris manuscript continues at that date without interruption, presenting the observations made on the following day.

The Paris manuscript is the most elaborate of all surviving observation registers. A second – but unfortunately incomplete – copy in the same hand is preserved in the *Biblioteca Nacional de Portugal* in Lisbon (*fig. 1*).[6] A comparison between the Paris and Lisbon manuscripts shows how carefully the Paris scribe has worked. Apart from the page format and page numbering, there is no textual difference between these two manuscripts. This means that we can be reasonably sure that the Paris manuscript is an almost verbatim copy of the lost 'original' press-ready Leiden manuscript, which evidently was compiled from material now mostly lost. Therefore, we have chosen to use the Paris copy of Marggrafe's observations as the basis for this text edition. However, all observations in the Paris manuscript were checked against data and text in the still available Leiden notebook and other Leiden draft sheets of paper, as well as the seventeenth-century extract compiled by Ismael Boulliau.[7] Whenever corrections or additions are made in the transcription, for example when an obvious copying error was made, this is stated in the footnotes.

Not included in this text edition are several loose drawings of the Recife observatory, its instruments and various calculations from Brazil, preserved in the Leiden archive. These are discussed in Volume 1, Chapters 8 and 9. Leiden documents relating to Marggrafe's

4 Marggrafe's digitized autographs in the Leiden archive were acquired by Oscar Matsuura on CD-Rom in 2006. Today the collection can be consulted via the website of the library of Erfgoed Leiden (ELO): https://www.erfgoedleiden.nl/collecties/bibliotheek, shelfmark LB 7000–1.

5 ELO, North no. 54 (draft observations of 24 December 1639) and North no. 59 (draft observations of 18– 21 December 1639).

6 Biblioteca Nacional de Portugal, Mss 6, n. 37. This Lisbon manuscript contains two library stamps. One that has been used since 1796 by the *Real Biblioteca Pública* (Royal Public Library), which was based on the collections of the *Biblioteca da Real Mesa Censória* (Royal Board of Censorship). This stamp was replaced in 1836, when the name was changed into *Biblioteca National*. A second stamp was applied after 1922. See for the ink stamps: *Do terreiro do Paço ao Campo Grande. 200 Anos da Biblioteca Nacional* (Liboa: BN, 1997), 164.

7 OdP, manuscript B12–13.

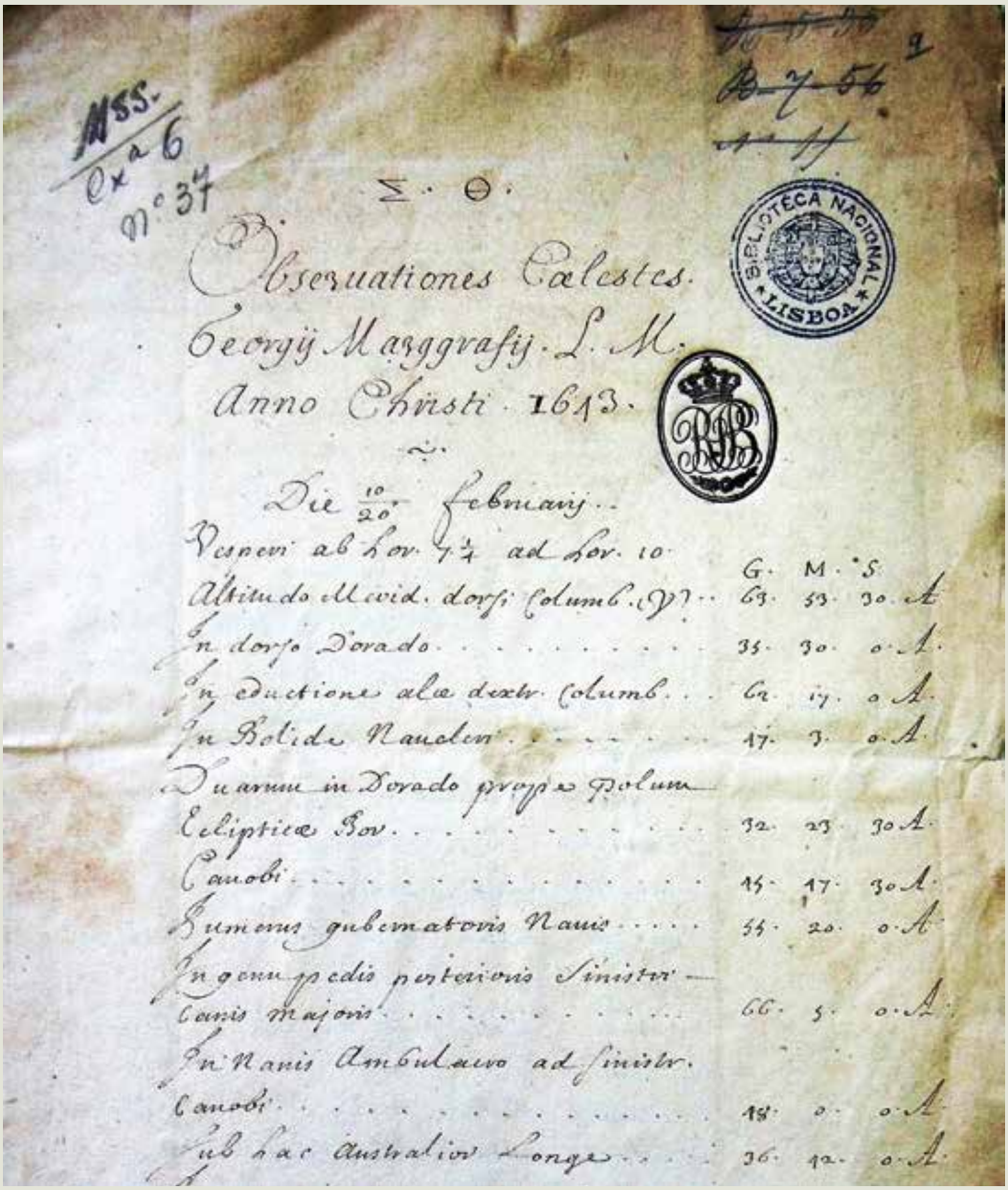

FIG. 1 Top page of the manuscript *Observationes Coelestes Georgij Marggrafij L.M.* of the year 1643, preserved in the Biblioteca Nacional de Portugal (Lisbon) with two library stamps, one introduced in 1796 by the Real Biblioteca Pública (Royal Public Library), the other after 1836, when the name was changed into Biblioteca National. (Photo by the authors).

astronomical observations in Brazil are the following, put in chronological order (first column the date, last column the numbers put in pencil on the documents by John D. North in 1979):

25 and 26 December 1638	North no. 41
15 to 21 September 1639	North no. 53, fol. 2r
18 September 1639	North no. 26vs
21 to 23 September 1639	North no. 53, fol. 2vs–3r
24 September to 14 October 1639	North no. 53, fol. 3vs–4r
28 September 1639	North no. 37
28 September 1639	North no. 51
15 October to 17 December 1639	North no. 53, fol. 4vs–5r
17 to 20 December 1639	North no. 53, fol. 5vs–6r
18 to 21 December 1639	North no. 59vs
19 December 1639	North no. 59r
20 to 24 December 1639	North no. 53, fol. 6vs–7r
18 and 21 December 1639	North no. 54, fol. 1vs–2r
24 December 1639	North no. 54, fol. 1r
24 December 1639	North no. 54, fol. 2vs–3r
24 December 1639 to 19 January 1640	North no. 53, fol. 7vs–8r
28 June 1640	North no. 32, 79
25 September to 4 October 1640	North no. 37
12 November 1640	North no. 6
7 to 15 October 1642	North no. 61
20 November 1642	North no. 49, fol. 1–2r
22 November 1642	North no. 49, fol. 2vs

A note about the English translation

The English translation (by both authors) aims at a correct understanding of the text, sometimes deviating from a translation that is too literal. Occasionally, it was typographically necessary to interrupt a line when it actually continues. In that case, this is indicated at the end of such a line with three dots (…), which also appear at the beginning of the next line. Abbreviated portions of text in the manuscript have been completed in the translation between square brackets [ ].

The identification of the observed celestial bodies has been performed by the astronomer Oscar Matsuura. In this task (completed in 2004), he was assisted by Andre Luiz da Silva, while he was an intern at the Planetário do Ibirapuera with a scientific initiation grant sponsored by the company Omnislux. Of great help in identifying the stars observed was the *SkyMap Pro 11 Software for Astronomers*, which gave the possibility of reproducing

and checking all astronomical observations.[8] Most observations were made at Marggrafe's observatory, for which current location we used the geographical coordinates 8° 3' 51" South and 34º 52' 37" West, applying as additional parameters an altitude of 10 meters and an average temperature of 25° C.

Marggrafe called several bright stars with names by which they are still known today. These are Arcturus (α Bootis), Fomahant Aquarii (Fomalhaut or α Piscis Austrini), El Karnar (Achernar or α Eridani), Canobus (Canopus or α Carinae), Capella (α Aurigae), Sirius (α Canis Majoris), Rigel Orionis (β Orionis), Spica Virginis (α Virginis), Procyon (α Canis Minoris) and Aldebaran (α Tauri). But other stars – constituting the majority – had to be identified by the personal description provided by Marggrafe, since the current designations did not exist in his time. To complicate matters further, the same star was often described in different ways. For example, the star we know today as η_2 Hydri is called by Marggrafe σ of the Water Snake, or '*the first star of the quintet*' of that asterism.[9] He used a sequential position, the beginning and end of which is often not clear, because it is not known which stars he has – or has not – included.

For identifying the stars, it was therefore crucial to follow the chronological sequence of the meridian passages, despite the relatively frequent occurrence of reversing the order of adjacent meridian transits. The identifications made in this way were those that seemed most plausible. They are all listed in the footnotes of the translation, together with the date of earliest sighting. Stars mentioned on the same page of the translated manuscript are not repeated in those notes.

Astronomical and other symbols used by Marggrafe in his manuscripts

measurements

①	Rhineland *voet* (foot) = 0.314 m.
②	Rhineland *duim* (thumb or inch) = $^1/_{12}$ foot = 2.62 cm.
lb	*Libra* (pound).
G	*Gradus* (degree, º).
M	Minute (') = $^1/_{60}$ degree.
S	Second (") = $^1/_{60}$ minute.
∂	Occasionally used symbol for degree (º).

8 Chris Marriott, *SkyMap Pro 11 Software for Astronomers*. Provided by the Thompson Partnership, Devon, England.

9 In current astronomy the Greek letter σ is no longer in use.

THE SOLAR SYSTEM

☉	The Sun
☾	The Moon (rising)
☽	The Moon (waning)
☿	Mercury
♀	Venus
♁	Earth
♂	Mars
♃	Jupiter
♄	Saturn

THE CONSTELLATIONS

Zodiac symbols are sometimes used to represent points on the ecliptic, with each symbol representing the "first point" of each sign. So Aries is the spring equinox, Cancer ♋ is the summer solstice, etc.

	In Latin	*In English*	
♈	Aries	Ram	
♉	Taurus	Bull	[*not used by M.*]
♊	Gemini	Twins	
♋	Cancer	Crab	
♌	Leo	Lion	
♍	Virgo	Maiden	
♎	Libra	Scales	[*not used by M.*]
♏	Scorpio	Scorpion	
♐	Sagittarius	Archer	
♑	Capricorn	Sea Goat	
♒	Aquarius	Water Carrier	
♓	Pisces	Fishes	[*not used by M.*]

Letters of the Greek alphabet were used to represent successive stars in a constellation.

OTHER

△	Upward triangle.
≙	Upward isosceles triangle.
∇	Downward triangle.
χ	Versus (towards).
o	Perpendicular to …
☌	Conjunction