GALILEO'S TELESCOPIC OBSERVATIONS IN PORTUGAL

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1 Introduction

This communication adresses a very specific topic: how and when were the new astronomical observations made with the use of telescopes, and the telescope itself, first known in Portugal? I hope to show that the answer to this concise question, brings to light many elements of a more general interest. The peculiar geo-political circumstances in Portugal in the first decades of the seventeenth century make an inspection of the knowledge of Galileo's telescopic discoveries in Portugal of interest not only to Portuguese scholars, but also to all interested in understanding the mechanics of the exceptional diffusion of these remarkable discoveries.

2 Telescopes and news about the telescope in Portugal

Telescopes first appeared in Portugal at a relatively early date, most likely in the years 1610-12.[2] Curiously, the evidence for this statement is drawn

[1] This work was only possible due to a Research Grant from Fundação Oriente, Lisbon.

[2] This question has been generally overlooked in the Portuguese historiography of science. In the most influential study on this question, the knowledge of the telescopic discoveries by Galileo in Portugal is dated to around 1630. See: Carvalho [1943]. A systematic investigation of the archival sources in Portugal related to this question has never been performed and so, other Portuguese scholars have accepted this opinion. For example: Albuquerque [1965].

primarily from events in regions very far away from Portugal; this reflects the historical circumstance that, at that period, Portugal controlled vast maritime routes in many parts of the world and was the focal point for many European travellers heading for overseas destinations.

In the opinion of a distinguished historian of Japanese science, the late Yoshio Mikami, telescopes were first introduced in Japan in 1613, brought, most likely, by Jesuit missionaries.[3] Since all missionaries heading for Japan (as well as all missionaries heading for India or China in this period), had to sail from Lisbon, and the trip to East Asia lasted, on average, two years, this means that telescopes must have been known in Lisbon by 1611.

One of the first reports on the use of a telescope in regions under Portuguese rule comes from Brazil. In the report of the battle of Guaxanduba, fought on November 19, 1614, major Diogo de Campos Moreno refers that the commander Jerónimo de Albuquerque was observing enemy movements with "hum oculo de longa vista".[4] The casual tone with which this information is mentioned makes one suppose that telescopes were not a novelty among military men, and since these news originate in Brazil it is very likely that telescopes were already known in Lisbon at least some months before.

In what concerns direct testimonials of the use of telescopes for astronomical observations performed in Portugal, the first evidence available comes from the lecture notes of the Italian Jesuit Giovanni Paolo Lembo (ca. 1570-1618), who taught mathematics in Lisbon in the years 1615-17.[5] In these classes, telescopes were built and astronomical observations were performed for the benefit of students and other interested persons. Since these lecture notes will provide the main part of this text, I will omit any further discussion at this point.

A different, but related, issue has to do with the *knowledge* of Galileo's new telescopic observations in Portugal. The spreading of these novelties does not imply necessarily that telescopes were already available, although one can plausibly assume that they spurred the desire to obtain the new optical instrument. In the diffusion of the new astronomical observations in Portugal the members of the Society of Jesuits played a crucial role. Although the relations of the Society of Jesus and its members with Galileo were complex and varied (ranging from admiration and friendship to outright hostility), it

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[3] The most detailed study about telescopes in Japan is Mikami [1948]. I have not used this work and I have drawn all information from Nakayama [1969, pp. 98-101]. It seems that the first telescopes in Japan were more artifacts destined to arouse curiosity than scientific instruments; but this is a pattern not much different from what happened at the early stages of the use of telescopes in Europe.

[4] In Moreno [1814]. This information was first noted in Sluiter [1997].

[5] The first person to notice that Lembo had taught in Lisbon, and to call attention to the relevance of this fact was J. Pereira Gomes [1968]. In recent years, Ugo Baldini [2000a, 2000b] has, more than once, also referred this and added important information.

is undisputed that the Jesuits were very influential in the spreading of news about the telescopic findings of 1610. One of the reasons to explain this lies in the fact that the Jesuits, especially those in Rome, had also been deeply engaged in these telescopic observations; in a sense, they were communicating discoveries which they could, with some reason, call their own. All this is reasonably known today.[6] In the case of Portugal, however, some circumstances made the role played by the Jesuits more central than in other countries. Two of these circumstances must be noted. First, it should be observed that in the first decades of the seventeenth century the Society of Jesus was the only institution in Portugal providing regular classes in mathematical and astronomical themes, at the *Colégio de Santo Antão*, in Lisbon. Mathematical classes were also taught by the Chief-Cosmographer, in Lisbon, and at the University of Coimbra, but in these two cases it is known that teaching was very irregular, with long periods in which no teacher was available. Secondly, as already hinted above, due to the fact that the Jesuit missions in China were dependent of the Portuguese Province, the mathematical experts that the Society sent to China had to pass through Portugal. They usually stayed some months in this country - in some cases, considerably more time - participated in informal discussions about the astronomical polemics, taught private classes of mathematics, etc.[7]

In the Jesuit network of residences and colleges news of the telescopic findings circulated with exceptional speed. In 1614, in China, the Portuguese missionary Manuel Dias (1574-1659) wrote in Chinese the *Tianwen lüe*, a small compendium on cosmographic and astronomical matters in the tradition of the literature on the sphere. At the end of this work is included a description, with figures, of the new telescopic observations. Dias reports on the uneveness of the Moon surface, the satellites of Jupiter, the peculiar appearance of Saturn, etc. He ends by promising that when the new instrument arrives in China he will write more about its marvelous use.[8] This means that news about these new findings had reached Lisbon at least two years before, that is, by 1612. Other pieces of information confirm this scenario. On November 1612, in India, the Jesuit Giovanni Antonio Rubino (1578-1643), wrote:

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[6] The literature on the scientific activities of the members of the Society of Jesus, and their scientific relations with Galileo has increased immensely in the past decades. I will not attempt to summarize it in here. Instead, the interested reader is directed to three recent works, where ample indications of recent bibliography are provided. See [Baldini, U., 1992], [Baldini, U., 2000c] and [Romano, A., 1999].

[7] The massive work by Francisco Rodrigues, [Rodrigues, 1931-1950] is still unsurpassed as the most complete study of the Society of Jesus in Portugal. More specialized studies focusing on the scientific activities of the Jesuits in Portugal are the ones by Albuquerque [1972] and especially those by Baldini [2000a; 2000b].

[8] Transcription and translation of the relevant parts of the *Tianwen lüe*, can be found in d´Elia [1947, pp. 24-28]. One interesting point to note is that Manuel Dias had not had an advanced training in mathematics. This means that the interest for the new astronomical questions transcended the group of Jesuit mathematical experts.

> Mi scrissero d´Italia che s´inventarono certi occhiali con i quali se veggono le cose distintamente 15 e 20 miglia lontano et si scuoprono molte novità ne´ cieli, principalmente nelli pianeti. Sarà grande charità mandarmeli Vostra Riverenza et insieme qualche tratatello sopra tali occhiali se v´è dimonstratione delle cose che si veggono. E se V. R. non me li può mandare, per non haver commodità o per non haver danari, la prego quanto posso che mi mandi *in scriptis et in figuris* il modo e l´inventione come si fanno, quanto più chiaramente sarà possibile; ch´io in questi apesi li mandarò fare, perchè non mancano officiali nè molta copia di cristalli".[9]

This letter means that news about the telescope and the new astronomical observations must have reached Lisbon in the year of 1611. Both the book by Dias and the letter by Rubino show that, as one might have predicted, the news of the telescope travelled faster than the instrument itself.

In sum, while there were no Portuguese directly involved in the cosmological and astronomical debates triggered by the publication of Galileo's *Sidereus Nuncius*, news of these debates, and the telescope itself, were known in Portugal not much after these events.

3 The lecture notes of Giovanni Paolo Lembo, 1615-17.

Of all the pieces of information summarized above one deserves a more detailed inspection. As far as can be ascertained today, the first telescopic observations carried in Portugal, and the first teaching of the new findings and their cosmological significance, were due to Giovanni Paolo Lembo. This Italian Jesuit is known to historians of science mostly because he was one of the four Jesuits that replyed to the questions Cardinal Bellarmino about the new celestial observations. In the years of 1615-17 he taught mathematics at the Lisbon college of Santo Antão.

Giovanni Paolo Lembo[10] was born in Beneveto, Italy, around 1570, and was admitted to the Society of Jesus on the 22nd of February, 1600, in Naples. From 1604 to 1607 he studied philosophy in the Jesuit college in Naples, and was called to Rome in 1607 where he studied Theology and attended Clavius' mathematical academy. At the Roman College he seems to have occupied himself mostly with astronomical instruments (in the Summer of 1610 he built the first telescope of the Roman College). On April 1611, together with Clavius, Grienberger and Maelcote, he was the author of the famous answer to cardinal Bellarmine's inquiry about Galileo's observations. From 1611 to 1614 he was again at the college in Naples, with

[9] Quoted in [d'Elia, P., 1947, pp. 23-24]. Originally in [Venturi, T., 1900, pp. 17-18].

[10] Biographical data on Lembo is collected from the works by Ugo Baldini [2000a, 2000b] and Romano Gatto [1994, p. 35].

adminsitrative duties. Around these years he met Giovan Battista Della Porta (1535-1615). In 1614 General Acquaviva sent him to teach mathematics in Lisbon. Lembo's stay in Lisbon was short. He was a teacher of mathematics at the *Colégio de Santo Antão* during the years of 1615 and 1617, but in December returned to Italy, due to his poor health. He died in Naples shortly afterwards, on May 31, 1618.

The mathematical course taught by G. P. Lembo in Lisbon in the years 1615-17 is very interesting. The lecture notes written by a student, in Portuguese, have been preserved in a codex, in good condition[11]. The topics covered in Lembo's mathematical classes can be appreciated by a brief description of its contents:

1r: Prologo em que se tracta da divisao das Mathematicas enventores e feitos exçelencias e Louuores que se lhe devem;
5v: Declaraçao da Sphera;
7r: Diuizão da Sphera;
10r: Composição da Sphera Material;
15r: Accabado o Tractado da forma e Região Ellementar comessa o Author a disputa da Região Etherea;
15v: Do n*umer*o e mouime*n*to dos Orbes Caelestiais conforme a opinião dos antigos;
22v: Dos 4 mouimentos do 8º Orbe conforme aos Modernos Astronomos;
29v: Da Ordem dos orbes Caelestes;
54r: Composição e huso de hum jnstrumento para achar a uariaçao da agulha (de) marear assim na terra como no Mar;
57r: Dos sinos, tangentes e secantes;
59r: [Os Elementos de Euclides] (livros I-IV);
66r: Arte perpectua do Computo Ec*clesiastic*o segundo a nova reformacao do anno do S*enh*or 1582;
71r: Breue tractado de Horologios de Sol;
95r: Tractado breue das Machinas Hydraulicas;
121r: O que mais se leo toccante ao tractado da Sphera no anno do S*enh*or de 1616 do prin*cip*io de Outubro por diante [...];
135r: Ordem por se fazer a superfície concava no vidro do longe mira;
135v: Para se fazer vidro conuexo do Longemira;
136r: Modo para nos Mappas ou globos se achar em legoas a distancia de alguns lugares a outros [...];

As can be observed, besides topics *De sphera*, and nautical questions, which were a constant in mathematical classes taught at Santo Antão in this period, other topics have been covered. The teacher taught trigonometry, Euclidean geometry and ecclesiastical computus. Of particular interest are the topics on

[11] It is in Lisboa, Arquivo Nacional-Torre do Tombo, Manuscrito de livraria, 1770.

machines and instruments, which are quite lenghty; these possibly reflect Lembo's personal interests and competence. There is much more to comment about this remarkle set of lecture notes besides what interests us here, but I will concentrate solely on the telescope and telescopic observations.

After a careful discussion of the traditional systems of orbs, Lembo prepares to introduce the new telescopic evidence. He does it by describing in detail the observations he himself had made in Rome in 1610, in particular the observations of the phases of Venus. This description is interesting, not only because the discussion on the phases on Venus is very detailed, but also because it confirms that the Jesuits in Rome had made observations of the phases of Venus prior to being informed by Galileo.[12] After the discussion on the phases of Venus, the Italian teacher states that (fl. 33v),

> A mesma obseruação fiz os meses passados estando iá aqui em Lixboa e a mostrei não somente a meus ouuintes mas tambem a outras pessoas curiosas [muitas] que a virão com pontas do mesmo modo que a lua no princípio menores, depois maiores cada vez mais. Falo com testemunhas de vista.[13]

This is the first documented reference to the making of astronomical observations with a telescope in Portugal. There follows a detailed discussion of the cosmological implications of these observations. This leads Lembo to reject both the Ptolemaic and the Copernican systems, and to adopt a semi-tychonic arrangement of the orbs. All the discussion is essentially technical, with only rare mentions of theological, or even philosophical argumentations. The defense of a variant of a Tychonic model in Lisbon in 1616 should be noted since, as his well known, the Society of Jesus would adopt "oficially" Tycho-Brahe's cosmological model only in 1620.[14]

In the final folios of the manuscript of Lembo's classes are included notes on the construction of telescopes (fls. 135r-v). These are instructions of a very practical nature, without any discussion of the theoretical principles of the telescope. Later teachers of mathematics in Santo Antão will include some discussion of these principles, but Lembo's instructions are a straight-

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[12] This had been claimed by Cristoph Grienberger in the letter he addressed to Galileo in 22 January 1611, and where Lembo is explicitly mentioned (See *Le Opere di Galileo Galilei*, [Edizione Nazionale], Vol. XI, pp. 31-35). Therefore, it is interesting to note that, in a wholly different context and using a completely non-polemical tone, Lembo confirms Grienberger's statements. The relevant passage is in fl. 33r, when Lembo comments that he had observed the phases of Venus, in Rome, in October of 1610.

[13] Translation: "I have made the same observation in the past months, when I was already here in Lisbon, and I showed it not only to my students, but also to many other curious persons. They have all seen it [Venus] horned in the same way as the Moon, first smaller and then each time larger. I speak with eye-witnesses".

[14] With the publication of *Sphera Mundi seu cosmographia* (1620), by Giuseppe Biancani. For detailed information on this question, see [Lerner, M.-P, 1995], [Baldini, U., 1992, pp. 217-250], and [Besomi, O. and Camerota, M., 2000].

forward presentation of the practical way to polish the lenses, with important indications on the choice of materials, and a step-by-step description of the whole procedure. To follow in detail the instructions, several figures are provided in the manuscript. [See the Appendix below, with a complete transcription of these instructions, but without the figures]. The inclusion of these instructions, the mention of telescopic observations, and Lembo's own expertise leave no doubts about the fact that in those years telescopes were built in Lisbon with the purpose of performing astronomical observations.

The course taught by Giovanni Paolo Lembo is remarkable in many ways, but it was not the sole occasion for an informed discussion of the new telescopic observations. Besides the men that taught at the College of Santo Antão, other Jesuits, well informed about the new discoveries, were in Lisbon, in transit to the Asian missions. In April 1618 one such group of missionaries sailed from Lisbon. On board the vessel *S. Carlos* were Giacomo Rho (1592-1638), Johannes Schreck (1576-1630), Wenceslaus Kirwitzer (ca. 1589-1626) e Johann Adam Schall von Bell (1591-1666). All these men were familiar with the new astronomical discoveries and their importance. Their transit via Lisbon was certainly an occasion for discussions on these topics and a spreading of these novelties in Portugal. During the 1620s the debate around cosmological issues was more intense and generalized. Of especial interest are the lecture notes of the German Jesuit, Johann Chrysostomus Gall (1586-1643), who taught mathematics in Lisbon between 1620 e 1627. Judging from the lecture notes that survived, the telescopic findings and their cosmological repercussions were regularly commented in the Jesuit classes in Lisbon.[15]

Finally, it is worth mentioning the Italian Cristoforo Borri (1583-1632). Borri taught mathematics in Coimbra in the year of 1626-7. In Coimbra he made telescopic observations together with D. André de Almada, a well-known professor of Theology at the University, with a strong interest in mathematical issues. He also taught mathematics at the college of Santo Antão, in Lisboa, in 1627-8. He was an important figure in the Portuguese scientific scene at the period and his book *Collecta Astronomica*[16], published in Lisbon in 1631, is the first printed work in Portugal with a detailed description of Galileo's telescopic observations and their cosmological importance, as well as a careful description of the telescope and its functioning.

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[15] Lecture notes of courses taught by C. Gall can be found in various documents in Portuguese archives. The most interesting are perhaps the ones in Lisboa, Biblioteca Nacional, Cod. 1869. I might also add that I have been conducting an intense research of all surviving manuscript notes of the mathematical courses taught at Colégio de Santo Antão. The documents thus far identified greatly increase the lists published in [Albuquerque, 1972] and [Baldini, 2000b]. Besides many questions of detail, taken together these notes reveal a much livelier interest for scientific matters in Jesuit colleges in Portugal than scholars have traditionally tended to believe.

[16] The book was printed in 1631, but the licenses are from 1629, and the book was presumably ready several years before. See [Borri, C., 1631].

Appendix: Lembo's instructions for the construction of lenses for telescopes

The lecture notes of the course taught by Giovanni Paolo Lembo contain (fls. 135r-v) instructions on how to prepare the lenses for a telescope. These instructions are accompanied by several figures that are ommitted in this transcription. Using <> I mark the places where these figures are found in the original text, as well as where marginalia appears. Although it is likely that most Galilean scholars can follow the Portuguese, an English translation would certainly be helpful. Limitations of space, however, do not allow for such a translation nor for the reproduction of the figures. A transcription of this text, and other relevant portions of the manuscript of Lembo's classes, together with photographic reproduction, notes and an English translation will be published shortly.

[fl.135r] Ordem p*ar*a se fazer a superficie concaua
no vidro do longemira que ficca p*ar*a o olho.

Tomar se ha hum compasso *e* abrir se á em hum 6º de palmo *e* com elle assim aberto se cortara em hum pequeno de metal asso, ou folha grossa de frandes, de modo que a superficie concaua fique igualm*en*te cortada <superficie concaua> *e* ter se a hum regrão grosso de chumbo <asso para a medida/forma do chumbo/quantos de quatro> (que se fará derretido o chumbo *e* deitado dentro em hum canudo de cana ou em hum buraco feito no chão com hum pao redondo) *e* depois huã das extremidades do regrão igualaremos com a superfiçie concaua do circolo assima dito; *e* na outra extremidade ficcara de 4 quantos p*ar*a se meter em hum buraco de broca *e* andando ao redor (estando o vidro que se ha de cauar em hum vão q*ue* se fara em huã taboa ou pao, tendo debaixo hum pedaço de feltro ou couro de antã *e* en cima estara huã taboizinha na qual esta feito hum buraco redondo, pello qual caiba o chumbo) <taboa p*ar*a cima do vidro> com huã pequena de area grossa ou *es*meril limaduras de asso, atee q*ue* se faça concauidade igual a outra superficie conuexa, <superficie conuexa> que se tirou do dito circolo que se entende ajustarão á conuexa na cauadura que se faz no vidro; tambem se tomara com hum compasso o semediametro de hum 4º de palmo que he o 8º *e* com elle as dilligencias assima ditas, *e* assim nas mais proporcoins q*ue* há no palmo *etc*.

Pera se achar huã proporção entre estas.

Tomar se ha hum *e* outro semidiametro iuntos em l*inh*a recta *e* no meo desta l*inh*a recta se porá huã ponta do compasso *e* se fará hum semicircolo *e* do ponto em q*ue* se ajuntão ambos os semidiametros se lancara em angulos rectos á circunferencia huã l*inh*a a qual da a proporção do m*ei*o entre hum *e* outro semidiametro com se vee na figura. <diametros menor, diametro do meo, Diametro major>

// [fl.135v] O lustro se daá com hum pao de choupo do feitio de regrão

de chumbo, *e* votando sobre o vidro huã pouca de Potea *e* gota de agoa *e* metendo o pao na broca *e* andando com ella atee q*ue* fique lustroso. //

[fl.135v] Para se fazer vidro conuexo do Longemira

Tomar se á hum compasso aberto em 2 palmos, ou 4; *e* com elle se cortam em asso ou assinara na folha de asso, ou de metal *e* disto se fará muj preciza de huã p*art*e a superficie conuexa *e* de outra com outro risco do compasso à concaua [<superficie conuexa superficie concaua>] *e* tomar se a huã pasta grossa de asso ou cobre, ou bronze redonda, *e* nella se cauará por huã p*art*e a modo de tabola de jugar atee q*ue* a superficie conuexa àjuste na cauadura. E p*ar*a se laurar o vidro se terão huns pãos redondos que caibão no punho da mão [<forma do pao em q*ue* se pega o vidro>] *e* na extremidade mais grossa se pegara o vidro com pees, *e* deitando huã pequena de aréa na prancha andaremos ao redor com o vidro por cima della atee que a outra superficie concaua ajuste *e* ajustando trabalharemos que o vidro saia da prancha (deitando lhe area peneirada) mui lizo. e p*ar*a dar lustro neste vidro se tomara huã regra grossa, de pas *e* em huã façe das largas se cauará atee q*ue* ajuste a superficie conuexa, *e* sobre esta cauadura se pregara com huns belmazes nas cabeceiras huã correa de anta [figure at the bottom] *e* botando lhe em sima potéa com huã gotta de agoa correremos o vidro atee q*ue* fique lustroso. A proporção entre estes vidros *e* os agudos de que prim*ei*ro fallamos não se trata por não estar bem experimentada, nem tão pouco a porção do cano. //

References

Albuquerque, L., "Sobre o conhecimento de Galileu e de Copérnico em Portugal no século XVII", *Vértice*, 256 (1965), Lisboa, 15-27.

Albuquerque, L., "A Aula da Esfera do Colégio de Santo Antão no século XVII", *Anais* [da Academia Portuguesa de História], 2ª série, 21 (1972), Lisboa, 337-391.

Baldini, U., *Legem Impone Subactis. Studi su Filosofia e Scienza dei Gesuiti in Italia, 1540-1632,* Bulzoni, Roma, 1992.

Baldini, U., "The Portuguese Assistancy of the Society of Jesus and Scientific Activities in its Asian Missions until 1640", in Saraiva, L. (Ed.) *História das Ciências Matemáticas, Portugal e o Oriente*, Fundação Oriente, Lisboa, 2000, 49-104.

Baldini, U., "L'insegnamento della matematica nel Collegio di S. Antão a Lisbona, 1590-1640", in *A Companhia de Jesus e a Missionação no Oriente*, Brotéria e Fundação Oriente, Lisboa, 2000, 275-310 [This work is also included in U. Baldini, *Saggi*, pp. 129-167.]

Baldini, U., *Saggi sulla cultura della Compagnia di Gesù (secoli XVI-XVIII),* CLEUP, Padova, 2000.

Besomi, O. and Camerota, M., *Galileo e il Parnaso Tychonico. Un capitolo inedito del dibattito sulle comete tra finzione letteraria e trattazione scientifica*, Leo S. Olschki, Firenze, 2000.

Borri, C., *Colecta Astronomica ex Doctrina P. Christophori Borri; mediolanensis, ex Societate Iesu. De Tribus Caelis, Aereo, Sydereo, Empyreo [...]*, Apud Mathiam Rodrigues, Ulysipone, 1631.

Campos Moreno, D., "Jornada do Maranhão por ordem de S. Magestade feito o anno de 1614", *Collecção de notícias para a história e geografia das nações ultramarinas que vivem nos domínios Portuguezes, ou lhes são vizinhas*, Academia Real das Sciencias, Lisboa, 1814.

Carvalho, J., "Galileu e a Cultura Portuguesa sua Contemporânea", *Biblos*, 19 (1943), Lisboa, 399-482.

d´Elia, P., *Galileo in Cina. Relazioni attraverso il Collegio Romano tra Galileo e i gesuiti scienziati missionari in Cina (1610-1640)*, Apud Aedes Universitatis Gregorianae, Romae, 1947. [English trans: *Galileo in China. Relations through the Roman College between Galileo and the Jesuit scientist-missionaries (1610-1640)*, trad. R. Suter and M. Sciascia, Harvard University Press, Cambridge, Mass., 1960)].

Gatto, R., *Tra Scienza e Immaginazione. Le matematiche presso il collegio gesuitico napoletano (1552-1670 ca.)*, Leo S. Olschki, Firenze, 1994.

Gomes, J. P., "Aula da Esfera", in *Enciclopédia Luso-Brasileira de Cultura*, Editorial Verbo, Lisboa, 1968, Vol. 7, cols. 1012-3.

Lerner, M.-P., "L'entrée de Tycho Brahe chez les jésuites ou le chant du cygne de Clavius", in Giard, L., (dir.) *Les Jésuites à la Renaissance. Système educatif et production du savoir*, Presses Universitaires de France, Paris, 1995, 145-185.

Mikami, Y., *Nihon sokuryo justu shi no kenkyu* [History of the Telescope in Japan] Tokyo, 1948.

Nakayama, S., *A History of Japanese Astronomy. Chinese Background and Western Impact,* Harvard University Press, Cambridge, Mass.,1969.

Rodrigues, F., *História da Companhia de Jesus na Assistência de Portugal*, Apostolado da Imprensa, Porto, 8 Vols., 1931-1950.

Romano, A., *La Contre-Réforme Mathématique. Constitution et Diffusion d'une Culture Mathématique Jésuite à la Renaissance*, École Française de Rome, Roma, 1999.
Sluiter, E., "The first known telescopes carried to America, Asia and the Artic, 1614-39", *Journal for the History of Astronomy*, 28 (1997), 141-145.
Venturi, T., *Alcune lettere del P. Antonio Rubino*, 1900.