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ON THE ALLEGED USE OF KEPLERIAN TELESCOPES IN NAPLES IN THE 1610s

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Abstract: The alleged use of Keplerian telescopes by Fabio Colonna in Naples from as early as October 1614, as claimed in some recent papers, is shown to be in fact untenable and due to a misconception.

Keywords: history of the telescope, early telescopes, Fabio Colonna, Giovanni Battista Della Porta, Naples 1610s

1 INTRODUCTION

At the 37th Annual Conference of the Società Italiana degli Storici della Fisica e dell'Astronomia (Italian Society of the Historians of Physics and Astronomy, SISFA), held in Bari in September 2017, Mauro Gargano gave a talk entitled "Della Porta, Colonna e Fontana e le prime osservazioni astronomiche a Napoli". This contribution, which appeared in the *Proceedings* of the Conference (Gargano, 2019a), was then followed by a paper—actually, very close to the former, which, in turn, is very similar to an earlier one (Gargano, 2017)—which was published, in English, in the same year in this Journal (Gargano, 2019b). In both of these papers, Gargano claims that the Neapolitan naturalist and member of the Accademia dei Lincei Fabio Colonna (ca. 1567–1640; Figure 1) would have made observations with a so-called 'Keplerian' or 'astronomical' telescope (i.e. with converging eye-piece) in the early autumn of 1614.

2 THE TELESCOPES OF DELLA PORTA AND COLONNA

The events relating to the birth and development of Keplerian telescope—named after Johannes Kepler (1571–1630), who theorised on this optical configuration in his *Dioptrice*, published in 1611—are complex and not well-documented, and their examination lies beyond the scope of this paper. However, from a historiographical point of view, the news that someone was already using such a configuration from as early as autumn 1614 for astronomical observations, if true, would have significant implications. As a matter of fact, it would mean to backdate by a couple of years the *terminus ante quem* for the construction of the first Keplerian telescope (Daxecker, 2004: 14; Van Helden, 1976: 25), and at least by 10 or 15 years its regular use for observations.

Gargano's claim is essentially based upon a passage in a letter that Colonna (1614) wrote to Galileo Galilei (1564–1642) on the occasion of the solar eclipse of 3 October 1614. The letter contains six sketches depicting the Sun's surface, partially eclipsed by the Moon, with the sunspots. The observation was made by projecting the solar image through the telescope onto a sheet of paper, a method widely used, among others, by Galileo himself, and first suggested by his disciple Benedetto Castelli (1578–1643; Galileo, 1613: 52). In the above-mentioned letter, Colonna (1614) apologises for the poor quality of his drawings, and invites Galileo to salvage as much as possible and to "… turn them right side up, since they came out from the telescope inverted [alla riversa]."

This is how Gargano (2019b: 54) interpreted Colonna's words:

> Upon reading this letter it is evident that

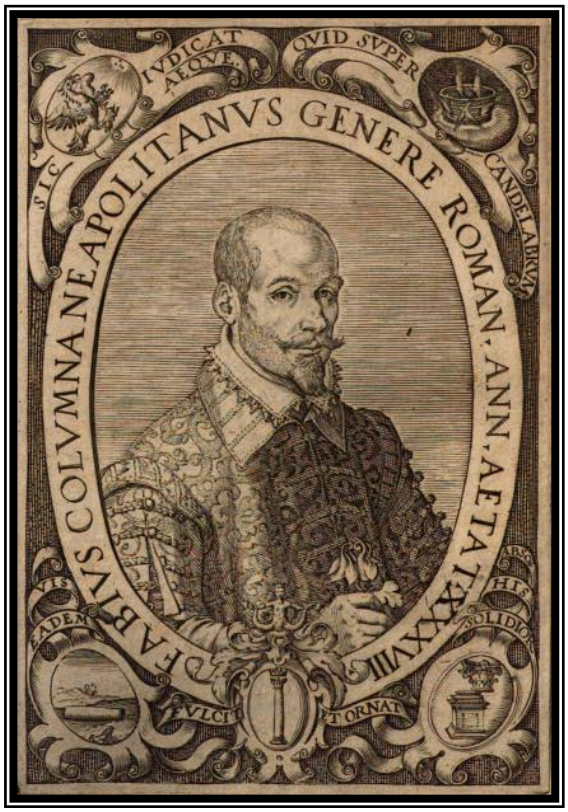

Figure 1: Fabio Colonna (https://it.wikipedia.org/wiki/Fabio_Colonna#/media/File:Ritratto_di_Colonna.jpg).

> Colonna used a telescope and not a Galilean spyglass.[1] Therefore, this was the first astronomical observation made from Naples using a Keplerian-like refractor.

But did Colonna really use a Keplerian telescope for his astronomical observations? As we shall see, the answer to this question is 'no'. Indeed, it is well known that, when used for direct observations, a Galilean telescope will provide upright images and a Keplerian telescope upside-down ones, but, if used in projection, a Galilean telescope gives upside-down images and a Keplerian telescope upright ones. It would seem that Gargano was unfamiliar with some aspects of geometrical optics and the early history of the telescope, otherwise he also would have known the following passage from the renowned work by Galileo, *Istoria e dimostrazioni intorno alle macchie solari e loro accidenti*, published in March 1613 (i.e. one and a half years before Colonna's letter):

> It should be noted next that [using the telescope by projection] the spots exit the tube inverted and located opposite to where they are on the Sun: that is, the spots on the right come out on the left side, and the higher ones lower, because the rays intersect each other inside the tube before they emerge from the concave glass. But because we draw them on a surface facing the Sun, when turning back toward the Sun, we hold the drawing up to our eyes, the side on which we drew no longer faces the Sun but is instead turned away from it, and therefore the parts of the drawing on the right-hand side are already in their proper place again, corresponding to the right side of the Sun, and the left ones on the left, such that one only has to invert the upper and lower ones. Therefore, turning the paper over and thus making the top the bottom, and looking through the paper while facing the light, one observes the spots as they should be, as if we were looking directly at the Sun. And in this appearance they must be traced and inscribed on another sheet in order to have them correctly positioned. (Galilei, 1613: 53; translation by Reeves and Van Helden, 2010: 127).

So, if we did not know the laws of geometrical optics, in the light of this detailed description and following Gargano's belief, we would be forced to think that Galileo was wrong or that Galileo himself had already abandoned the optical combination named after him, in favour of the Keplerian one, at the beginning of the 1610s.

Besides, Gargano seems also not to know the passage in the *Rosa Ursina* where the German Jesuit Christoph Scheiner (ca. 1575–1650) describes the projection technique by using both a concave (diverging) lens, and, as an alternative to it, a convex (converging) one (Scheiner, 1630: 129^{v}, 130^{r}). Therein, Scheiner correctly states that these telescopes project upside-down and right-side up images, respectively.

One could argue that the expression 'alla riversa', used by Colonna in his letter to Galileo, might refer not to the vertical (up-down) inversion, but to the horizontal (left-right) one. Actually, 'riversa' is an Italian archaic term for the modern 'rovescio' or 'rovescia', which, used in the expressions 'al rovescio' or 'alla rovescia', have the generic meaning of 'upside down', 'wrong side up', 'wrong way round' or even 'back to front' (inside out). However, even though the optical paths of the Galilean and the Keplerian telescopes are completely different, when used for projection, both produce mirrored images, namely, if one looks at the screen from the side of the eyepiece, left and right are reversed. This is why, in order to get all orientations correct, both Galileo (as we saw above) and Scheiner (ibid.) recommended transposing the projected images onto the opposite surface of the sheet of paper by tracing it against the light. Hence, the two optical configurations are indistinguishable on this account, and therefore, even if Colonna really meant a mirror-like inversion of the image, this circumstance does not prove anything about the type of optical configuration, Galilean or Keplerian, that he used.

We have already touched upon the implications of Gargano's interpretation on the chronology of the development of the Keplerian telescope, but he goes further: he claims that the new optical configuration

> … did not derive from Kepler's studies or those of Fontana, but was the result of the combined theoretical and practical skills of Della Porta and Colonna. (Gargano, 2019: 54),

who therefore, in Gargano's opinion, would be the true originators of the Keplerian telescope. Gargano's statement is based on a letter from Giovanni Battista Della Porta (1535–1615) to Galileo, dated 26 September 1614, i.e. exactly one week before the afore-mentioned letter from Colonna to Galileo of 3 October. In his letter, Della Porta informs Galileo that he is working, together with Colonna, to realize "… a new kind of telescope, that will increase a hundredfold the performance of the usual ones." (Della Porta, 1614). However, Gargano (2019: 54) takes it for granted that Della Porta and Colonna were working on the development of a Keplerian telescope—which, as we shall see later, is more than unlikely, and, in

any case, unproven—and that this new, unspecified instrument was the one that Colonna used to observe the eclipse just one week later. As a matter of fact, neither in the letter to Galileo of 3 October nor elsewhere in the following months, did Colonna claim that he was using a new kind of telescope, different from those (Galilean instruments) that he usually used in making his observations. Nor is there any evidence to suggest such an hypothesis. Furthermore, I find it rather odd that Colonna, working by himself and without Della Porta—his partner in this project—would have tested such an innovative instrument with just one observation, made upon hurriedly returning home between two judicial hearing in the court-house of Naples, where he practised law for a living (Colonna, 1614). Besides, as far as we know, Della Porta (who was to die a few months later) makes no further mention of this mysterious new telescope. In all likelihood, Della Porta and Colonna were working on an improvement of the Galilean telescope, in order to achieve higher magnifications by increasing the focal length of the objective lens and/or decreasing the focal length of the ocular, but apparently this project led nowhere.[2]

In my opinion, the irrefutable evidence that Colonna did not use a Keplerian telescope in 1614 is contained in a letter from Colonna to Federeico Cesi (1585–1630), one of the founders of the Accademia dei Lincei, which is not mentioned by Gargano in his paper and has been neglected by most historians of the telescope. This letter, dated 19 September 1626, contains a reference to a small telescope made by the Neapolitan optician Francesco Fontana (1585–1656) that undoubtedly had a converging eyepiece:

> This friend [Francesco Fontana] has also invented a … telescope, long just a palm,[3] which shows objects upside-down, but magnifies them very much, and, what is most remarkable, it shows objects so near that those which are as far away as a musket shot are seen close to the eyes; I could not understand yet, because I cannot attend to that, due to my job, how it can do that, since two convex lenses show objects more distant and smaller than they actually are, but more sharply; when I get around to going to him, I will examine it, and I will obtain one to His Excellency. (Colonna, 1626).

That passage shows conclusively that—twelve years after his letter to Galileo—Colonna still could not understand, either theoretically or in practice, how two convex lenses could be used to form a telescope.

3 CONCLUDING REMARKS

It would seem that Gargano's comments about Colonna's supposed Keplerian telescope were mainly due to his inadequate survey of primary and secondary sources about the early history of the telescope. But he was probably also misled by Paolo Molaro and Pierluigi Selvelli, who in several papers published over the last decade have promoted the erroneous ideas that (1) The telescope depicted in the 1617 painting *The Sense of Sight* by Jan Brueghel the Elder and Peter Paul Rubens, is a Keplerian one, and therefore, that this optical configuration was already rather common at this time (Molaro and Selvelli, 2009: 330–332); (2) "There are no apparent reasons to question Father Zupus's declaration to have used Fontana's [Keplerian] telescope in 1614 … [and therefore that] the year of 1608 does not seem so implausible as the birthdate of Fontana's [Keplerian] telescope." (Molaro, 2017a: 227; cf. Molaro, 2017b: 275); and (3) As early as around 1615 Fontana had acquired such a reputation as an optician that one of the greatest painters of that time, José de Ribera, portrayed him in his painting *Allegory of Sight* (Molaro, 2017b: 284–286).

4 NOTES

1. It should be noted, incidentally, that Gargano seems to use the terms 'telescope' and 'spyglass' incorrectly. This erroneous use of the two terms is even clearer in the same passage of the original Italian version of the paper, in which Gargano (2019a: 271) uses 'telescopio' and 'cannocchiale', to indicate a Keplerian telescope and a Galilean (or Dutch) telescope, respectively. However, originally the two Italian terms were synonyms, whereas nowadays 'cannocchiale' survives only in everyday language, and it is usually used to indicate a refracting telescope, especially if of modest size. In any case, the possible semantic difference between the two terms in no way lies in the fact that a 'telescopio', without any attribute, would produce upside-down images, and a 'cannocchiale' erect ones.
2. Albert Van Helden (pers. comm., 28 January 2021) is of the same opinion.
3. Until 1840, the Neapolitan 'palm' was 0.263670 m.

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