



The Observer

February 2019 (#45)

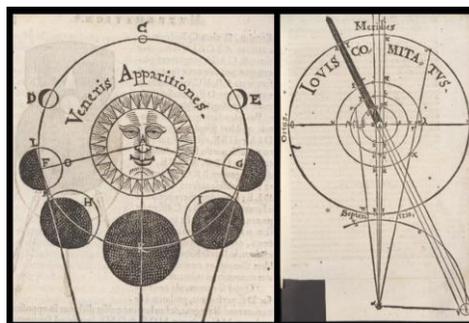
Schedule of public programs on last page!

GALILEO'S NEWLY-DISCOVERED LETTER

This past September the journal *Nature* reported on how a long-lost letter of Galileo has been recently found by a science historian at the University of Bergamo, Salvatore Ricciardo. And *Nature* said Galileo lied. Lied? So what was the letter, and what was he lying about?



Before we get to the lying, let us consider the situation surrounding the letter. The story gets started in about 1608, with the invention of the telescope. Copernicus's book about his heliocentric theory (saying the Earth circles around the sun and revolves on its own axis), a book entitled *De Revolutionibus*, had been published in 1543; seven decades had passed with no great interest in that book from outside the world of science. But the telescope and the



The phases of Venus (left) and the moons of Jupiter (right), from the 1614 *Disquisitiones Mathematicae* of Johann Georg Locher and his advisor, Christoph Scheiner.



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discoveries Galileo made using it—like the phases of Venus, which demonstrated that Venus must circle the sun, or the moons of Jupiter, which showed that celestial bodies could circle other celestial bodies—had made astronomy into something that was on the minds of people who probably would not have had astronomy on their minds otherwise.

Some such people were the powerful de' Medici family of Tuscany. In December of 1613 Fr. Benedetto Castelli, a mathematics professor and one of Galileo's friends and followers, had breakfast with the de' Medicis. It was a Thursday, December 12 probably. Grand Duke Cosimo II de' Medici, the ruler of Tuscany, asked Castelli if he had a telescope. Castelli said that he did and that in fact the night before he had been observing Jupiter with its "Medicean planets" (the moons, so-named by Galileo). The mother of the Grand Duke, Her Most Serene Ladyship Christina of Lorraine, remarked, apparently to herself, that the "Medicean planets" had better be real and not an artefact of the telescope.



Christina of Lorraine, Cosimo II de' Medici, and Benedetto Castelli

The Grand Duke asked another professor who was at the breakfast, Cosimo Boscaglia, about this. Boscaglia answered that the Jovian moons were real, as were all of Galileo's astronomical discoveries. However, Boscaglia made the point to Her Ladyship that the Earth did not move, and that the Bible stood contrary to the idea of its motion.

After the breakfast, the de' Medicis summoned Castelli back, and Her Most Serene Ladyship Christina ended up arguing against Castelli, citing the Bible against any motion of the Earth. Castelli, who felt that Her Ladyship was challenging him largely to hear what he had to say,

stood his ground despite being seriously intimidated by debating among the rich and the powerful. The Grand Duke and his wife sided with Castelli—the younger de' Medici generation against the older. On December 14, a Saturday, Castelli wrote a letter to Galileo about all this (this letter still exists, which is how we know what happened at the breakfast). Galileo responded with a letter on December 21, the next Saturday, congratulating him. This December 21 letter is the letter *Nature* has discussed.

“What greater fortune can you wish,” wrote Galileo, “than to see their Highnesses themselves enjoying discussing with you, putting forth doubts, listening to your solutions, and finally remaining satisfied with your answers?” Just what all scientists want: to be listened to by rich and powerful people. No doubt he had in mind a grant! Then Galileo offered a rebuttal to Her Most Serene Ladyship’s Biblical objection to Earth’s motion. “Holy Scripture can never lie or err,” he wrote. Nevertheless, “its interpreters and expositors can sometimes err in various ways,” such as by limiting themselves to the literal meaning of its words. Then one would have to attribute to God things like regret, hate, and ignorance of future things (Galileo may have been thinking of passages such as Genesis 6:5-7, where God regrets making mankind, or Malachi 1:3, where God hates Esau and his descendants). Scripture is written to accommodate the understanding of common people, he said, so it would be imprudent “to oblige scriptural passages to have to maintain the truth of any physical conclusions whose contrary could ever be proved to us”.

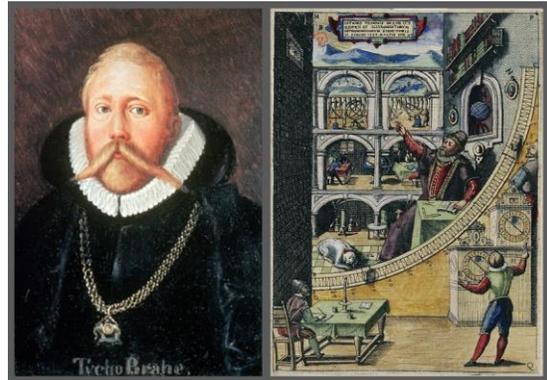
The letter became popular among Galileo’s followers and was copied and circulated. By February of 1615 a Dominican friar named Nicolò Lorini filed a complaint with the Inquisition regarding the letter. Lorini, noting that the Dominicans were the “black and white hounds of the Holy Office”, complained about how the letter said that, when the question was about natural phenomena, Sacred Scripture had to take second position to philosophical or astronomical arguments. Galileo in fact said just this in the letter. Lorini also threw in some other hearsay complaints—how he heard it said that the Galileo gang spoke disrespectfully of the early church fathers, of St. Thomas Aquinas, and of Aristotle; and that “to appear clever they utter and spread a thousand impertinences around our whole city”, and so on. None of that is found in Galileo’s letter. Lorini said that he thought

that Galileo's posse were "men of goodwill and good Christians, but a little conceited and fixed in their opinions".

But Lorini had accused Galileo of heresy before, in 1612, and had afterward written a note of apology. This new charge did not gain much traction, either. A consultant for the Inquisition found that, except for some bad-sounding choices of words, there was nothing questionable in the letter. Galileo's name was cleared.

Now, before we talk about the lying and Galileo's letter, we must talk about the science of the time, and what the letter was *not* about. The letter was not about telescopic discoveries. Remember Castelli and the de' Medicis and Boscaglia? Boscaglia had said that *the Jovian moons were real*, as were all of Galileo's astronomical discoveries. But he rejected Copernicus.

Boscaglia could do this because of the Danish astronomer Tycho Brahe. Brahe, who had died fifteen years earlier, had been the most prominent astronomer of the age. He had been lord of his own island, where he ran a huge astronomical research program with all the best instruments and all the best observers, all funded by the King of Denmark.



Tycho Brahe, left, and representations of Brahe's research program in action.

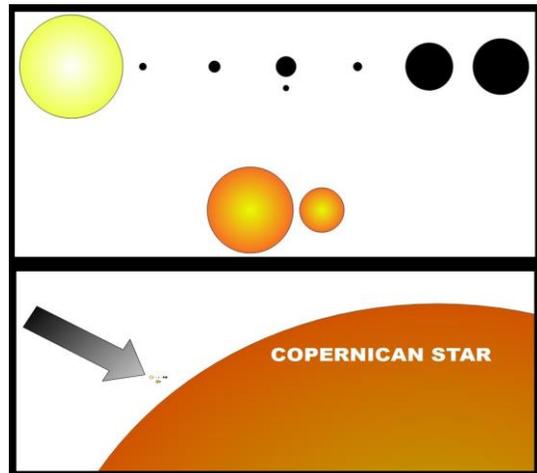
Brahe had been an anti-Copernican. Boscaglia could assert that all Galileo's astronomical discoveries were real, and also assert that Earth did not move—he could have his cake and eat it too, so to speak—because Brahe, impressed with aspects of the Copernican system but rejecting the idea of Earth's motion, had developed his own system. In Brahe's geocentric system, the sun, moon, and stars circle the Earth. The planets circle the sun. The stars lie just beyond Saturn.



Brahe's system, as illustrated in Locher's *Disquisitiones Mathematicae*.

Brahe had calculated that, were the stars as distant as Copernicus had supposed—so that the Earth's orbit would be nothing by comparison, producing no observable effects in the stars—then they would also have to be enormous in order to appear as large as they do in the sky (Brahe measured their apparent sizes). Every last star, even the smallest, would dwarf the sun. And that, Brahe said, was absurd.

By contrast, in Brahe's system the stars were not so distant. In it, the sun, moon, and stars circled an immobile Earth while the planets circled the sun. The stars lay just beyond the planets, and, being not so distant, did not have to be so huge. In Brahe's system, celestial bodies all fell into a consistent size range. To many astronomers, the monster stars required by the Copernican system were indeed absurd. Brahe's system was, in their eyes, far more reasonable.



Top—Sizes of the sun, planets, and stars in Brahe's system. Bottom—Sizes of the sun and planets (little dots under the arrow) and an average star under the Copernican system.

Galileo's discoveries were all fully compatible with Brahe's system. Anti-Copernicans like Boscaglia could accept Galileo's discoveries like those phases of Venus that proved it to circle the sun, because in Brahe's system Venus circled the sun, which then in turn circled an immobile Earth. In fact, some astronomers embraced the telescopic discoveries as providing proof that old ideas about how the universe works were right. For example, those illustrations of Venus and Jupiter seen on the first page of this newsletter were by Johann Georg Locher, who thought the telescope supported Tycho, and that it even supported the ancient epicycle theory of Ptolemy (Jupiter's moons circling Jupiter proved the reality of epicycles, he said, and darned if that isn't true in its own way). In Locher's Jupiter illustration (above), note the sun circling Earth down in the lower right corner.

Locher was a fan of Galileo's. He spoke highly of Galileo, a Copernican, while slamming on his fellow geocentrists, Brahe and Simon Marius (Marius is the astronomer who claimed to have independently discovered the Jovian moons, and who gave them the

names we now use—Io, Europa, Ganymede, and Callisto). Galileo would later repay Locher's support by portraying Locher as a clod and Locher's book as stupid. As discussed elsewhere in this blog, Galileo could do some strange things.

And that brings us back to Galileo's letter and to lying. Two versions of Galileo's December 21 letter to Castelli exist in the historical record. That letter is not about science, but about Her Most Serene Ladyship's Biblical objection to Earth's motion and about interpreting the Bible. I have read the entire letter and I have seen the original Italian of both versions. The key differences between the two versions are shown below. The changes are both in sections where Galileo discusses why the Bible might not give a scientific description of natural phenomena. One version of the letter is more likely than the other to offend a reader who places a high value on the words of the Bible. Such a person is probably not going to like the description of the Bible 'perverting' its own dogmas, for example.

Version 1

Onde, sì come nella Scrittura si trovano molte proposizioni le quali, quanto al nudo senso delle parole, hanno aspetto diverso dal vero, ma son poste in cotal guisa per accomodarsi all'incapacità del volgo....

So, since in Scripture there are many propositions which, based on the naked sense of the words, have a different aspect from the truth, but are placed in such a way to accommodate the incapacity of the commoners....

Version A

Onde, sicome nella Scrittura si trovano molte proposizioni false, quant' al nudo senso delle parole, ma porte in cotal guisa per accomodarsi all'incapacità del numeroso volgo....

So, in Scripture there are many false propositions, based on the naked sense of the words, but placed in such a way to accommodate the incapacity of the numerous commoners....

Version 1

Anzi, se per questo solo rispetto, d'accomodarsi alla capacità de' popoli rozzi e indisciplinati, non s'è astenuta la Scrittura d'adombrare de' suoi principalissimi dogmi....

Indeed, if by this respect only, to accommodate the capacity of rough and undisciplined peoples, the Scripture did not abstain from overshadowing its principal dogmas....

Version A

Anzi, se per questo solo rispetto, d'accomodarsi all'incapacità del popolo, non s'è astenuta la Scrittura di pervertire de'suoi principalissimi dogmi....

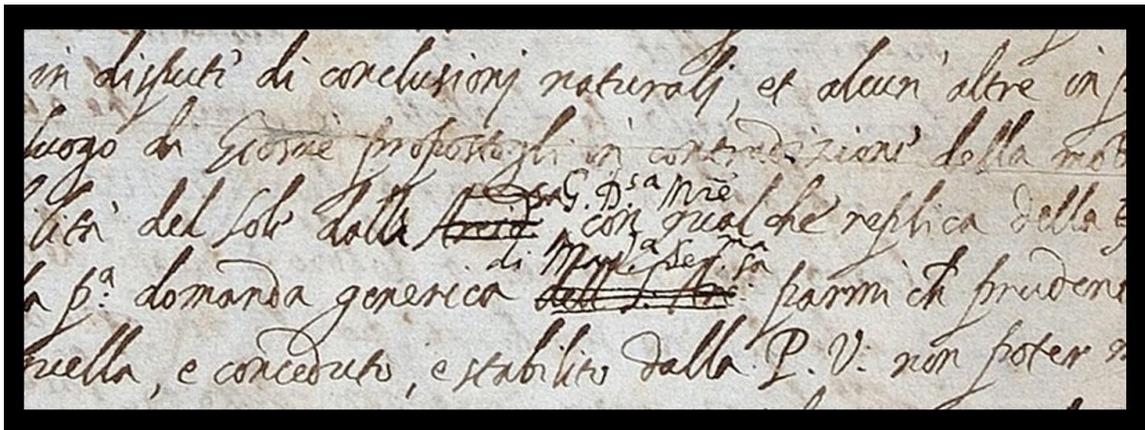
Indeed, if by this respect only, to accommodating the incapacity of the peoples, the Scripture did not abstain from perverting its principal dogmas....

Galileo always claimed that the original version of letter that he wrote was the more gently worded version—Version '1' seen here—and that someone doctored a copy of the letter and sent it to the

Inquisition to get him in trouble. In other words, Version 'A', according to Galileo, was a fake. He went through some trouble to convince people, and the Inquisition, of this. But now *Nature* has given us Version 'A' in Galileo's own hand, with scratch-outs and such indicating changes to be made. Apparently, Galileo lied. In fact, he wrote Version 'A'. To quote the editors of *Nature*,

Galileo, it now seems clear, doctored his original letter himself, to make the language less aggressive, as soon as he realized the trouble heading his way. This suggests that the editing was not the malign work of theologians trying to make a stronger case against him, as had been assumed by the nineteenth-century scholar Antonio Favaro...

—and, I would add, by people like me. For years I've been teaching my students about how poor Galileo was given the shaft by the dirty tricks crowd who altered his letter to get him into trouble. Now I have to change my textbook!



Some of the letter reported on by *Nature*. This is in Galileo's own handwriting.

Let us note a few key points here.

First point: Galileo's December 21, 1613 letter to Castelli was a letter about scripture, not science. The changes that Galileo made to the letter were in wording regarding scripture, not science.

Second: Galileo wrote the letter in response to the views of Her Most Serene Ladyship Christina of Lorraine, mother of Grand Duke Cosimo II de' Medici, the ruler of Tuscany. He did not write the letter

in response to some aspect of the official church. This is counter to, for example, what the editors of *Nature* have written:

...the letter sets down for the first time the scientist's gripes with the Vatican's doctrine on astronomy...



The editors of *Nature* are incorrect here.

Last: the science of all this was far from settled at this time. Remember that Her Most Serene Ladyship's wingman Boscaglia said all the telescopic discoveries were true—he just said they did not show the Earth orbited the sun. He could point to Brahe to support what he was saying. And recall the general confusion of the time—the geocentrist Locher, supporting the heliocentrist Galileo and attacking the geocentrist Brahe, for example.

One additional thing to recall is that Galileo did not get in trouble at this time. Even though the Inquisition looked at the “more offensive” version of his letter, they found that, except for some bad-sounding choices of words (exactly the items Galileo tried to change), there was nothing questionable in the letter. But, unfortunately, astronomy, and specifically the Copernican system, was now on the minds of yet some more people who probably would not have had astronomy on their minds otherwise: members of the Roman bureaucracy, who now felt the need to weigh in on astronomy.

Thus, by March 3, 1616 the Inquisition in Rome had ordered Galileo to stop promoting the heliocentric theory; minutes from their February 25 meeting show that they were prepared to threaten him with jail if he did not comply (that threat was not needed—minutes from March 3 show that Galileo had agreed to comply). By March 5 the Congregation of the Index had declared heliocentrism to be a “false” theory that was “altogether contrary to scripture”. The Congregation's declaration does not provide their reasoning on this, but we can speculate that they thought it was safe to say heliocentrism was “false” because Brahe's geocentrism made more sense, and of course it was contrary to scripture because of passages that describe the sun as moving:

The sun rises and the sun goes down, and hurries to the place where it rises (Ecclesiastes 1:5, NRSV).

The Congregation moved to censor portions of *De Revolutionibus*. Galileo reported in a letter of March 6 that he was not mentioned in any declarations, that he would not have been involved at all had his enemies not dragged him into it, and that he handled the affair in a manner befitting a saint. In a letter of March 12 he reporting having a 45-minute audience with Pope Paul V, where he informed the pope about the “implacable malice” of his enemies, and in response the pope said to put his mind at ease and feel safe, because pope and others all held him in such regard that no one would be listening to slanderers.

Nevertheless, the “Galileo Affair” had been set in motion.

Otter Creek-South Harrison Observatory produces research, mostly related to the history of astronomy, including the first translation of Locher’s work. Visit our web page and click on “Research” to see examples.



UPCOMING PROGRAMS AT THE OBSERVATORY

ALL TIMES ARE EASTERN TIME. **ALL PROGRAMS ARE HELD AT THE SOUTH HARRISON PARK LOCATION.** PROGRAMS WILL BE HELD EVEN IN THE EVENT OF CLOUDS OR LIGHT RAIN.

HOWEVER, PROGRAMS WILL BE CANCELLED WHEN CONDITIONS MAY PRODUCE *HAZARDOUS DRIVING* ON THE TWO-LANE ROADS THAT LEAD TO THE OBSERVATORY (CONDITIONS SUCH AS HEAVY RAIN, THUNDERSTORMS, FOG, SEVERE WEATHER OR FLASH FLOOD WARNINGS, SNOW OR ICE, HIGH WIND, ETC.). **IN SHORT, PLEASE DO NOT MAKE THE TRIP TO THE OBSERVATORY IN BAD WEATHER.**

- **February 16, 2019 (evening program).** *Program begins at dark (at approximately 6:45 pm).* Program features the waxing gibbous moon, stars, and two planets—Mars and Uranus—all weather permitting (what we will be able to see depends on the weather). 
- **March 2, 2019 (daytime program).** *Program begins at 10:00 am.* Come observe the sun through a safe solar filter, and learn about the sun, the seasons, and time—weather permitting (what we will be able to see depends on the weather). 
- **March 23, 2019 (EQUINOX evening twilight program).** *Program begins just before sunset (at approximately 7:50 pm).* Tonight we will be having a special program featuring a discussion of the seasons and viewing of the stars, and a viewing of the International Space Station passing through the constellations of Cassiopeia and Cepheus and passing below the North Star (approx. 9:20 p.m.)—all weather permitting (what we will be able to see depends on the weather).  
- **April 20, 2019 (SPECIAL evening twilight program).** *Program begins at sunset (at approximately 8:25 pm).* Tonight we will be having a special program featuring the stars and a discussion on the **Science of the Calendar and the Dates of Easter & Passover**—all weather permitting (what we will be able to see depends on the weather). 