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Galileo Gleanings III

A Kind Word for Sizzi

By Stillman Drake *

1

FRANCESCO Sizzi has a tiny niche in history as one of the many victims of savage court intrigue at Paris during the reign of Louis XIII. In the history of science he has thus far had a slightly larger but still less distinguished place as the author of an attempted refutation of Galileo's first telescopic discoveries — the *Dianoia astronomica* of 1611.¹ Both Kepler and Porta promptly dismissed this work (quite correctly) as trifling, the latter writing to Federico Cesi: "I have received the book against Signor Galileo, than which I have never seen anything more absurd on earth."² Only Galileo seems to have had a kind word for Sizzi at that time. Transmitting to Filippo Salviati a copy of Kepler's remarks about the *Dianoia*, he wrote in part: "As I have often told you and others, I had much rather gain the friendship of Sig. Sizzi by forgiving him all insults than have him as an enemy through conquest. And for that reason I have managed also to apologize for him among the Jesuit fathers, who read his puerilities with vast amusement."³

Galileo's judgment of the man turned out to be correct, for despite the silly and mystical arguments Sizzi had presented in his book he soon afterwards made a real contribution to science. Such, at any rate, is the thesis to be offered here. Long after his death he was destined to figure anonymously in a dramatic struggle between two much greater men, a struggle which was not without grave consequences to the history of astronomy in Italy. Nor is that all. Galileo has never been entirely exonerated from grave charges that have been made against his character, almost uninterruptedly, from his day to our own. If the reconstruction of events presented below is correct, the keystone of that arch of calumny will have been removed, or at least loosened.

2

Of Sizzi himself little is positively known. By birth a Florentine patrician, he appears to have left his native city for Paris shortly after the publication of his book in 1611. There he entered the service of Leonora Galigai (or of her brother, the Archbishop of Tours). Wife of the Florentine adventurer Concino Concini, Maréchal d'Ancre, this remarkable woman for a time exercised virtually the power of a queen of France through her ascendancy over the regent-mother, Marie de' Medici. Concini, for several years the most influential man at the French court, was murdered in the summer of 1617 at the instance, or at least with the consent, of the young Louis XIII. Not long afterwards Mme. la Maréchale was arrested and sentenced to death on flimsy

* San Juan, Puerto Rico.

¹ *DIANOIA astronomica, optica, physica, qua Syderei Nunciū rumor de quatuor planetis a Galilaeo Galilaeo mathematico celeberrimo recens perspicilli cuiusdam ope conspectis,*

vanus redditur. Auctore Francisco Sitio florentino. Venetiis, M DC XI.

² *Le Opere di Galileo Galilei*, Edizione Nazionale (Florence, 1890-1909), xi, 157.

³ *Ibid.*, xi, 91.

charges of treason, heresy, and the practice of magic. It is possible that Sizzi had cast some of the horoscopes seized among her papers, which were used to bolster the absurd charges laid against her, for Professor Antonio Favaro states that Sizzi "was involved in the trial of Elena [sic] Galigai, Maréchale d'Ancre."⁴ But whether or not Sizzi was implicated directly in 1617, he was barbarously executed a year later. The circumstances may be partly reconstructed from the following accounts.

G. B. Nelli, citing an anonymous manuscript in his library, says of Sizzi, "This unfortunate author, seven years after trying to contend against Galileo, had the imprudence to write at Paris a book against the King of France and his government, for which he was stretched on the wheel and garotted on the 19th July, 1618. Thus he learned how much difference there is between criticizing a philosopher and censuring the actions of a monarch."⁵

Cardinal Richelieu in his memoirs describes in more detail the events leading up to Sizzi's death. Writing of M. de Luynes, he says: "While strengthening his own position on the one hand, he undertook on the other to ruin so far as he was able the opposing party, to repress Barbin, and to blame him for the entire conduct of the Queen. This business made a good deal of noise at court. . . . Some persons became involved in this affair who imprudently produced ill-advised writings on the subject of Luynes and the affairs of the times. Durand⁶ was imprisoned for this, as well as a man named Sity, a Florentine, who had been secretary to the Archbishop of Tours, brother of the Maréchale d'Ancre. A single book was imputed to both men, and for this they were ordered to be broken and burned, together with their writings . . . while a brother of the said Sity, who had merely transcribed a copy of it, was hanged."⁷

If Richelieu is correct in saying that but one book was in question, it must have been the *Ripozographie* mentioned in a note to the memoirs of the Marquis de Fontenay-Mareuil: "Put to death at this time were Durand, who made all the king's ballets, and two Italians who had been of the household of the Maréchal d'Ancre, for some writings in praise of the Queen-mother and against the existing government."⁸ To this statement by the Marquis, the editors have appended the identifying note: "Marie Durand, accused of being the author of a pamphlet against Luynes entitled *Ripozographie*." On the whole it would appear that Sizzi's was at worst a case of imprudence and perhaps no more than one of guilt by association.

During Sizzi's residence in Paris, however, he did not spend all his time casting horoscopes or meddling in politics. Not long after his arrival he fell in with a group of competent mathematicians — among them Jacques Aleaume, a pupil of Vieta's. This association soon removed his previous hostility to the new sciences, vindicating the judgment of him that Galileo had already expressed privately to his friends. For in July, 1613, Father Horatio Morandi at Rome wrote to Galileo a letter that commenced as follows:

I am sending you the letter of Signor Francesco Sizzi, so that you and others may be confirmed by this new event in the conviction that truth is one, and that all men who are born with the ability to accommodate their minds to it must sooner or later fall under the victorious banner of those who philosophize by contemplating the ample and beautiful book of nature, and do not league themselves

⁴ *Ibid.*, xx, 539.

⁵ *Vita e Commercio Letterario di Galileo Galilei* (Lausanne, 1793), i, 236.

⁶ "One of the polished poets of his time, and particularly inventive in the creation of ballets,"

note the editors of the memoirs.

⁷ Michaud and Pouloulat, *Nouvelle Collection des Mémoires pour servir à l'Histoire de France* . . . (Paris, 1837), vii, 183-184.

⁸ *Ibid.*, v, 131.

with the sophistries of men who have attempted not only to imprison this unhappy science, but even to fetter it with unworthy chains of Aristotelian opinions and the crippling manacles of capricious philosophasters who swear by the words of unsound masters. I assure you of my pleasure at hearing that Signor Sizzi has emerged from the obstinate confusion into which he was once led by the mad throng; he seems to me to have been reborn, and by losing all he had to have regained it. But truly his fine mind could not long remain submerged in the murky sea of so many errors.⁹

The letter which Morandi enclosed had been sent to him by Sizzi from Paris on 10 April 1613. Among the things dealt with was the dispute over floating bodies which had led to several publications by Galileo and certain Peripatetics. This dispute had begun about the time Sizzi left Florence; though it was waged by his former philosophical allies there, he now acknowledged the entire justice of Galileo's position as against theirs. The historically significant passages of Sizzi's letter, however, dealt with quite another matter. To appreciate their importance, we must run ahead to some events which did not take place until nearly two decades later, long after Sizzi's voice had been stilled by death.

3

In the discussions with Pope Urban VIII which paved the way for the publication of Galileo's long-promised treatise on the Ptolemaic and Copernican systems, he had been repeatedly forbidden to attempt any physical proofs of the motion of the earth. So long as he confined himself to philosophical arguments and considerations of mathematical simplicity, he would be safe — or so he was told. Nevertheless, in writing his *Dialogue* he did employ two arguments which he himself regarded as physical proofs. One of these was based upon the apparent paths of sunspots, and the other upon the existence of the ocean tides. The latter argument, which occupies the last "day" of the *Dialogue*, had been composed as early as 1616. The argument from sunspots, however, made its first appearance in the *Dialogue*, where it occupies some ten pages. This argument depends entirely upon the inclination with respect to the ecliptic of the sun's axis of rotation, and neither in Galileo's published writings nor in his surviving letters is there any mention of this tilt prior to 1632. On the contrary, he had in a number of places previously described the paths of sunspots as parallel to the ecliptic, notably in his *Letters on Sunspots* of 1613.^{9a}

Now about two years before the *Dialogue* was published, and not long after its manuscript had been submitted to the censors, the Jesuit Father Christopher Scheiner had published his *Rosa Ursina*,¹⁰ in which the annual variations in the apparent paths of sunspots were correctly described. Inasmuch as Scheiner had long been a rival claimant for priority in the discovery of sunspots, and in view of certain other circumstances which will be mentioned presently, Galileo's late appearance in print concerning this matter has been regarded as highly suspicious. In this connection the suggestions of Emil Strauss have been very generally accepted. Strauss wrote, in part, as follows:

The account of the discovery of sunspots which Galileo puts into the mouth of

⁹ *Opere*, xi, 530.

^{9a} *Opere*, v, 189; *Discoveries and Opinions of Galileo* (New York, 1957), 125.

¹⁰ *Rosa Ursina sive Sol ex admirando facul-*

arum et macularum suarum phoenomeno varius . . . a Christophoro Scheiner germano suevico societate Jesu . . . Bracciani . . . Impressio coepta anno 1626, finita vero 1630, Id. Junii.

Salviati¹¹ has the purpose of establishing his priority over Scheiner. Scheiner's claims had been based upon his observations of March, 1611, mentioned in the letters which he wrote under the pseudonym of Apelles. Prior to 1630 there had been no open conflict between Scheiner and Galileo; yet a conflict must have taken place in private circles, as otherwise there would be no point to Galileo's attack in *Il Saggiatore*. Scheiner had merely written in the *Mathematical Disquisitions* of 1614¹² that the spots "had been portrayed by Apelles in two pictures, whence also by Galileo . . .," and thereby in apparent good faith he had already made the attempt to establish his priority, which had previously been contested only by an incidental remark of Galileo's in his first letter to Welser. Antagonism to Galileo was in fact so far from Scheiner's thoughts at this time that in the book mentioned he refers to him frequently with the highest respect, and he sent Galileo a copy of the book with a very courtly letter of transmittal.

The literary feud in a hostile sense was begun by Galileo — perhaps, as remarked above, upon provocation from Scheiner by word of mouth. Without naming any names, Galileo quite unmistakably suggested in *Il Saggiatore* that Scheiner had tried to wrest from him the glory of the discovery of sunspots.¹³ Against this assault Scheiner bitterly took up arms in the *Rosa Ursina*, which was completed and published at Bracciano in 1630.

Galileo's *Dialogue* was first published in 1632, but it had been ready for the press in the middle of May, 1630; hence it had no relation to the *Rosa Ursina*, though the contrary has often been asserted. During the writing of the *Dialogue*, Galileo knew of the impending publication of the *Rosa*, and probably of its polemic tone; perhaps even of its scientific content. Accordingly . . . he inaugurated a new battle against his opponent . . .¹⁴

More striking than Galileo's assertion that he had already seen sunspots at Padua in 1610 is his remark that the yearly period of the spots had been known to him in Salviati's lifetime. Salviati died in March, 1614. Hence during the more than sixteen years which had elapsed before completion of the *Dialogue*, Galileo would have been aware of a fact to which he assigned the highest importance, and one (if we are to put any faith in this passage) whose significance he recognized at the moment of the discovery. Now would Galileo, who already had so many priority battles on his hands, have let this go by for all of sixteen years without making any communication of it? That would have been quite contrary to his practice, especially at first. Would he not have recorded his discovery, if necessary under the protection of an anagram? Instead, and precisely at the time when his rival Scheiner communicated the same fact to the scientific world in his *Rosa Ursina* (pp. 161 ff. and p. 225), Galileo decides at last to reveal the secret which he has so long hidden for no apparent reason.

One can hardly repress the suspicion that Galileo either was actually acquainted with the *Rosa Ursina* when he composed the passage in question, and that he utilized the long interval which elapsed between completion of the *Dialogue* in 1630 and its publication [in 1632] to insert this passage; or that just as he knew of the pending appearance of the *Rosa*, so he knew also something of its content, and in order to anticipate his rival he finally turned to further observations of the sunspots and made the discovery for himself.

. . . If Galileo wanted his story to be credible, he ought at the very least to have given a reason for his enigmatical silence. Yet even later, in his letter to Fulgenzio Micanzio of 9th February 1636, he merely says that "I discovered it

¹¹ *Opere*, vii, 372-383; *Dialog ueber die beiden hauptsächlichsten Weltsysteme* . . . (Leipzig, 1892), pp. 361-372; *Dialogue Concerning the Two Chief World Systems* (Berkeley, 1953), pp. 345-356. (Although the title page of Strauss's translation bears the date 1891, the book was not published until after his death in February, 1892.)

¹² *Disquisitiones mathematicae de controversiis et novitatibus astronomicis*. Quas sub praesidio Christophori Scheiner . . . publice disputandas posuit, propugnavit . . . Joannes Georgius Locher . . . Ingoldstadii . . . M.D.C.

XIV. Galileo attributed this work to Scheiner in indexing the postils to the *Dialogo*, though the corresponding postil does not contain the attribution. This last-minute addition of Galileo's is further evidence that he had not seen the *Rosa* when the printing of the *Dialogue* began, as set forth later in this paper.

¹³ The belief that Galileo intended Scheiner alone in his attack in *Il Saggiatore* has been shared by every writer on the subject. Reasons for rejecting it are set forth in the closing section of this paper.

¹⁴ *Dialogue*, tr. Strauss, pp. 553-554.

[the tilt of the sun's axis to the ecliptic] before him, of that I am convinced; but I had no occasion to speak of it outside the *Dialogue*." ¹⁵

The imputation thus made against Galileo is indeed a serious one, and the evidence in its favor may at first seem overwhelming. To steal a scientific discovery is bad enough in any case; but to plagiarize from the very rival whom one has previously accused of plagiarism on the same general topic is entirely beyond the pale of decency. Hence so long as such a suspicion has rested on Galileo, many other charges of bad conduct on his part have managed to retain some spark of life—even some that have been adequately answered, refuted, and discredited in the minds of fair men. And this, the gravest charge of all, is unique in having gone entirely unanswered. Yet before we proceed to examine it, let us recall that when Strauss wrote his notes to the *Dialogue* (which have been extensively utilized in subsequent English, Polish, and Russian translations and have not yet been surpassed in general excellence), no relevant document had been published which could throw light on the difficult questions that he raised. Such a document was published shortly after his death, but its relevance to this point appears to have escaped even the vigilance of the great scholar who brought it to light in his monumental edition of Galileo's works. It is to that document that we now turn our attention.

4

Of the letter which Sizzi wrote to Morandi in 1613 the original is extant, as well as a contemporary copy corrected in several places by Galileo's own hand. Thus there can be no doubt either as to the authenticity of the letter or the fact that Galileo had read it attentively and preserved it all his life. Both the original and the copy are clearly legible; hence no question exists about Sizzi's words, though his meaning in certain places is vexingly ambiguous or obscure. Here is a translation of the crucial passages:

. . . concerning the opinion of Galileo and those other literati about the sun-spots, I should take it as a great favor if you would speak more at length. And to give you a reason, I shall tell you what is known to us by continued observations of almost a year. This makes us believe (with due respect to the authority of Galileo and those others, whose pupils we recognize ourselves to be) that the said spots are not always being newly generated and dissolved about the body of the sun. . . .

Our arguments against this opinion are: the equable motion they maintain in passing across the solar surface; the distance preserved between them (except as this varies through the plane representation of a globular figure); the size of the angles between the spots, together with the regular motion of both one and the other; the definite and uniform change of place that occurs between the rising and setting of the sun (except that this partly opposes that of midday); all which have been minutely observed by us. To this I can add the specific appearances according to the variation in tilt of the ecliptic in the solar surface; for the angles made by the spots at the equinoxes with the imaginary perpendicular line in the sun and parallel to our view differ from those made at the solstices—which in

¹⁵ *Ibid.*, p. 555. In this argument Strauss exaggerates the importance of Salviati's having died in 1614. So far as that goes, Galileo never saw Sagredo after 1609. Many of the conclusions he reached in later years were nevertheless placed in the mouths of these two men when he wrote the *Dialogue*, which after all was no less a literary than a scientific work. And as a

matter of fact the passage Strauss refers to states specifically that some years had elapsed between the publication of the *Letters on Sun-spots* and the discovery of the tilted axis (*Opere*, vii, 374; *Dialogue*, p. 346). Hence Galileo made no pretense of having found it in Salviati's lifetime; the use of his friend's voice was merely a necessary literary device.

turn differ between themselves, since the angle which at one solstice will be considered as in one of the four quadrants of the solar surface will be in the opposite quadrant¹⁶

Sizzi goes on to tell Morandi that he has deliberately withheld his further conclusions in order to stimulate in others the same curiosity which he and his friends have experienced concerning these matters. Perhaps some of the expressions in the passages just quoted were deliberately made cryptic for a similar reason, or perhaps these merely exhibit Sizzi's characteristic style, which had drawn exasperated comments from Kepler and Galileo concerning the *Dianoia*. Many alternative translations might be given of the passages quoted. But in any translation the hints supplied by Sizzi's letter were more than adequate to direct the attention of an interested astronomer to the existence of variations in angle between the sunspot paths and the ecliptic at various seasons of the year.

5

Sizzi's letter came into Galileo's hands about six months after he had published his *Letters on Sunspots*. Recognizing it as a possible source of Galileo's first acquaintance with those appearances which implied a tilt of the sun's axis of rotation, let us next consider the probable course of events which followed.

It has already been remarked that the tidal argument for the earth's motion had been written early in 1616, when Galileo was at Rome to battle against prohibition of the Copernican system. On that occasion he certainly employed every argument he could muster, unhampered as yet by official restrictions against "physical" proofs; yet he made no mention of an argument based on sunspots. It seems safe to conclude that at that time this line of reasoning had not yet occurred to him. But this in no way contradicts his having read Sizzi's letter. It is one thing to know of an annual variation in the sunspot paths, and quite another to link this with the motion of the earth. The connection is so far from obvious that Strauss, centuries later, rejected Galileo's reasoning as entirely fallacious, though it is far from being so. The sunspot argument would in fact have afforded Galileo a much more powerful means of convincing his mathematical opponents that some terrestrial motion must exist, than did the erroneous tidal argument which he invoked during his desperate effort to save Copernicus from prohibition by the Church.¹⁷

After the banning of the heliocentric theory in 1616, Galileo was for several years in no position to utilize any new arguments for the earth's motion, if any occurred to him. Probably none did, as he was not in the habit of dwelling

¹⁶ *Opere*, xi, 491-492. The critical passage reads: . . . a questo potendo aggiugnere le determinate apparizioni secondo la diversità della declinazione nella superficie solare, perchè altri sono gl' angoli che osservano nell' equinozii con la linea perpendicolare imaginata nel sole et parallela alla nostra vista, altri ne i solstizi, et ancora differenti da loro di parte, poichè quell' angolo che in un solstizio sarà considerato in una delle quarte della superficie solare, sarà nella quarta opposta. . . .

¹⁷ Anton von Braunmühl, discussing Scheiner's posthumously published *Prodromus pro sole mobile in Christoph Scheiner als Mathematiker, Physiker, und Astronom* (Bamberg, 1891), pp. 75-76, says that Scheiner was willing

to grant a diurnal but not an annual motion to the earth. Though not published until 1651, the *Prodromus* was written shortly after Galileo's condemnation and is directed against the sunspot argument and Galileo's priority claims. Whether Scheiner actually made the above admission in the *Prodromus* itself, I do not know, as I have been unable to consult the work. If he did, it is at once a credit to Scheiner's understanding and an illustration of the truth of my statement in the text above. Galileo's argument was designed only to show the probability, and not the necessity, of an annual motion of the earth; but implicitly it contains an almost rigorous proof of some terrestrial motion.

upon matters that could be of no use to him. He was ill a good deal of the time, and much of the rest he spent upon such safe projects as that of determining longitudes at sea. For seven years he published nothing. When, in 1623, he put forth *Il Saggiatore*, he was still careful to abstain from pressing the Copernican view; in fact he tried to appear as having forever rejected it. It was not until the following year that this situation had altered sufficiently for him to feel free once more to turn his mind to these arguments.

When Galileo wrote to Micanzio that he had discovered the tilt of the sun's axis long before Scheiner, but had had no occasion to mention it until the *Dialogue*, the latter statement was literally true. Quite possibly the former one was too, for he may have seen as early as 1613 that such annual variations in sunspot paths as Sizzi hinted at must imply a tilt of the axis. But he certainly did not deduce anything about the earth's motion from this until late in 1629. For on April 21st of that year, writing to Cesare Marsili apropos of recent news that Scheiner would soon publish a thick folio volume on sunspots, he remarked that any such book would surely be filled with irrelevancies, as there was no more to be said on the subject than he had already published in his *Letters on Sunspots* sixteen years before.¹⁸ It is most improbable that he was here dissembling any additional knowledge; that was never his habit in writing to his personal friends.

At the time he wrote to Marsili, Galileo had laid aside the *Dialogue* for more than two years. But on the 29th of October in the same year he wrote to Elia Diodati at Paris to say that about a month previously he had resumed work on it and would soon publish it; that it would be filled with novelties and contain ample confirmation of the views of Copernicus.¹⁹ Within two or three months the book was completed. In February, 1630, he was writing the marginal notes and additions necessary to round it out, and in May he arrived at Rome to submit the manuscript to the censors.

For various reasons printing did not begin until June, 1631 — more than a year later — but even then Galileo had not actually seen a copy of the *Rosa*, and his knowledge that it contained a bitter attack on himself seems not to have moved him to try very hard to get one. It was only in September, 1631, when the printing of the *Dialogue* was about one-half completed, that the *Rosa* came into his hands. Having seen it he at once wrote letters of indignant protest to friends and to the powerful nobleman to whom it was dedicated — something he clearly would have done before if he had seen the book.²⁰

6

It was the opinion of Strauss, who knew nothing of Sizzi's letter, that Galileo got his clue to the tilt of the sun's axis either directly from the *Rosa* or by means of further observations conducted in the knowledge that Scheiner was attacking him on the subject of sunspots. There are fatal objections to these suggestions, both from internal and external evidence. The internal evidence depends on the fact that although Galileo in his own ten-page discussion uses the most acute mathematical reasoning, he displays entire ignorance or complete neglect of the observational data. His argument is, in the main, that if the sun's axis had some undefined tilt with respect to the ecliptic, then the

¹⁸ *Opere*, xiv, 36.

¹⁹ *Ibid.*, 49.

²⁰ See the *Opere*, xiv, 294–295, 297, 299, 322.

paths of the sunspots would appear sometimes curved and sometimes straight as the earth made its annual trip around it, and that the same appearances could be accounted for only by the most complicated and implausible motions of the sun if the earth remained stationary. At the conclusion of this hypothetical reasoning he asserts that protracted observations have confirmed its premises. He does not state the times when the paths would appear straight, nor the degree of the observed tilt, as Strauss duly noted.²¹ Now it would be natural enough for him to omit these data from a popular book if he did not know that his ancient rival had discovered, published, and crowed over them. But if he knew that, he would in this way be deliberately taking second place; and that was never his custom.

But that is not all. To the extent that Galileo's argument did imply a degree of axis tilt and a timing for the path shapes, these were utterly wrong. Surely Galileo would not have invented and published a theory irreconcilable with observable data as set forth by an antagonist if he had seen those, and Scheiner's description of the phenomena is very detailed and accurate. He states quite clearly in the *Rosa* that the times of rectilinear motion of the spots occur in summer and winter, while their "equilibrations" with the ecliptic take place at the beginning of March and of September.²² Galileo, on the other hand, implies almost the exact opposite, if he does not ignore these questions completely.²³ Hence he can hardly have stolen his data from Scheiner. Likewise, observations of any duration made for himself would have prevented his implicit reversal of the facts. And if he had any hint that his rival had discovered something new on this subject, that ought to have deterred him from publishing a mere guess. Hence the most plausible explanation of Galileo's argument is that it resulted from a "thought-experiment" during the winter of 1629-1630, when he was pressing to find every possible

²¹ *Dialog*, p. 556. The problems concerning Galileo's use of the word "meridian" in his sunspot argument, first raised by Strauss, are most interesting. In writing a note for my own translation of the *Dialogue*, I overlooked the possible relevance of another passage in that work (*Opere*, vii, 287, ll. 36-37; *Dialogue*, p. 263) in which Galileo implies a belief that the sun's axis was parallel to the earth's at all times. See further under note 23, below.

²² I have been unable to consult the *Rosa* directly, but Dr. Alexander Pogo of the Mt. Wilson and Palomar Observatories has kindly supplied me with the following passages from pages cited by Strauss:

pp. 161-162: *Et prioribus quidem tribus huius semestris mensibus, id est, Martio, Aprili, Maio, omnes arcus itinerarii erunt concavi in Austrum orientalem, convexi in Aquilonem occidentalem; aliis vero tribus posterioribus, post Stationem aestivalem rectilineam, id est, Iunio, Iulio, Augusto, convertent itinera Macularum suas concavitates in Septentrionem occidentum, convexitates autem in Austrum orientalem.*

Contraria hisce evenient, ab Aequilibrio autumnali, quod contingit semper in fine Augusti atque initio Septembris, usque ad Aequilibrium Vernum, in cuius tribus mensibus, Septembris, Octobri, Novembri, omnes Macularum viae sunt concavae versus Aquilonem borealem [sic] convexae erga austrum occidentalem, mensibus autem tribus posterioribus, Decembri, Ianuario, & Febuario, postquam Statio hyemalis rectilinea celebrata est, flexus

itinerarii sunt cavi in austrum occidentum, convexi in Septentrionem ortivum.

p. 225: *... hunc motum ad sensum rectilineum, easdem facere ad Eclipticam inclinationes, quas exhibuit motus anno 1624. praesentatus & praesentandus hoc anno 1625. atque sequenti 1626. inter mensem Novembrem atque Decembrem; in hoc solo differunt, quod [sic] tendentiae illorum sint veluti deinceps contrariae: nam Motus inter Maium & Iunium rectilineus, fit semper oblique ex borea versus austrum; ille autem inter Novembrem & Decembrem semper ex austro oblique tendit in boream.*

²³ If Galileo literally meant "meridian" when he first introduced it in his sunspot argument, then he implied that straight paths would be seen at the equinoxes. This appears to belong to the earlier stage in the development of Galileo's argument at which he believed, perhaps for cosmogonical reasons, that the two axes were parallel (see note 21 above). In writing the ten-page argument he tempered this to some extent. He left the degree of tilt perfectly general and undetermined, but neglected to rid himself of the restriction on timing implied by this word "meridian." In this sense the argument bears the mark of haste, but not at all in the sense implied by Strauss. The haste was in completing the manuscript, not in inserting the argument while it was being printed. The section bears signs of having been often rewritten, with inconsistencies produced through successive changes, rather than of having been dashed off in speed. The rigor of the reasoning would alone almost preclude the latter theory.

argument for Copernicus. His interest for this purpose being merely in the general consequences of a tilted axis, if his only data came from Sizzi's ambiguous remarks about changes in the apparent sunspot paths at the solstices and equinoxes, it would be no wonder for him to have fallen into precisely the error that he made.²⁴

It remains to state now the external evidences that the sunspot argument was not inserted in the *Dialogue* after Galileo had seen the *Rosa*. At that time the book was half printed. It is perfectly possible that Galileo then added a clause supporting his original sunspot priority by invoking certain Venetians who were still living, as Favaro suggested.²⁵ But it is incredible that he could have added ten pages of text which contained a brand new argument for Copernicus. One need only recall that the *Dialogue* was already a notoriously controversial book, that it had been subjected to unusual and unreasonable delays and revisions to satisfy the censor at Rome, and that it had then been subjected to a complete review by the authorities at Florence. It is most unlikely that the printer of such a book would accept this kind of new material from the author without specific approval of the censor, or that the Florentine censor would not in turn consult Rome about it. But even apart from this, there is strong evidence that no such addition took place. The sunspot argument is one of the three powerful points in favor of Copernicus that are singled out for special mention in the closing pages of the *Dialogue*.²⁶ These closing pages, like the famous preface, had been the subject of almost endless scrutiny, revision, and criticism at Rome for over a year. Separate copies of them had been made and sent back to Rome after Galileo had taken the manuscript to Florence. Hence, if the ten pages in question had been added to the middle of the book during printing without consultation of or without objection by the Florentine censor, and without having been referred to Rome for approval, the fact of their insertion could not have been concealed later. The corresponding change in the final pages would surely have been detected by the special commission appointed at Rome after publication of the *Dialogue* to search it for any pretext on which Galileo could be prosecuted. Such a violation of the imprimatur would have leapt to their eyes, and would have provided ample grounds for prosecution in place of the flimsy charges actually brought by the commission against the book.

The existence of Sizzi's letter thus undermines, if indeed it does not destroy, the suspicion that Galileo plagiarized from Scheiner in the *Dialogue*. Nevertheless, Scheiner was convinced that he had been illtreated, and he exerted all his influence at Rome to have the *Dialogue* condemned and its author punished. It is regrettable therefore that Galileo, when he wrote this part of the *Dialogue*, did not feel obliged once more to say a kind word for Sizzi.

7

Because the controversy between Galileo and Scheiner has figured so prominently in this paper, it seems appropriate to review in conclusion the widely held theory that Galileo brought all his troubles on himself by vigorously attacking Scheiner in *Il Saggiatore*. That book opened with a long (and eminently justified) complaint against the many persons who had stolen

²⁴ Possibly it was not an error but an omission; still, the same conclusion would follow.

²⁵ *Oppositori di Galileo*, iii, Christoforo Scheiner, *Atti del R. Istituto Veneto di scienze,*

lettere ed arti, 1919, Tomo 78, parta seconda: p. 82.

²⁶ *Opere*, vii, p. 487; *Dialogue*, p. 462.

or belittled its author's ideas and discoveries. Coming to the matter of sunspots, Galileo wrote:

How many men attacked my *Letters on Sunspots*, and under what disguises! The material contained therein ought to have opened to the mind's eye much room for admirable speculation; instead, it met with scorn and derision. Many disbelieved it or failed to appreciate it. Others, not wanting to agree with my ideas, advanced ridiculous and impossible opinions against me; and some, overwhelmed and convinced by my arguments, attempted to rob me of that glory which was mine, pretending not to have seen my writings and trying to represent themselves as the original discoverers of these impressive marvels.²⁷

It was natural enough for Scheiner to take this accusation as directed at himself, and equally natural for him to feel outraged. If it had been directed solely against him, the utter injustice of the final passages would have afforded an adequate excuse for almost any steps he might have taken in reply. We may forgive Scheiner for his misinterpretation, as he was not acquainted personally with Galileo, and did not know that injustice of any kind was foreign to his nature. But that it was a misinterpretation is abundantly clear. The final words cannot by any stretch of the imagination apply to Scheiner. He had been disposed of in the opening passage, with the words "under what disguises."²⁸ At most he may have been included again as one who "advanced ridiculous and impossible opinions." But he could not possibly be described as "overwhelmed and convinced" by Galileo's arguments; still less could Galileo have meant to reproach him for "pretending not to have seen my writings." As a matter of fact Scheiner's own letters on this subject were the publicly acknowledged reason for Galileo's first writings about sunspots.

Scheiner says in the opening page of the *Rosa* that when he came to Rome in 1624 and was shown this passage, he at first thought that his "Italian critic" must have meant somebody else; but that when he searched he could not find that anyone but Apelles (i.e., himself) had written, spoken, or done anything whatever on sunspots. Here he was seriously in error. There had been another writer, of whom we shall speak presently, shortly before *Il Saggiatore* was published, and Scheiner had as much reason to resent him as Galileo did. And there had been a great many other people who had publicly debated and discussed Galileo's sunspot views in Italy ten years before Scheiner arrived there, and who were still in Galileo's mind. The Jesuit fathers at the Roman College, where Scheiner made observations mentioned in the *Rosa*, could have informed him of at least one of these debates, for many years earlier they had defended Scheiner's views against a Dominican who supported Galileo's.²⁹ Moreover, there was at least one other man whom Galileo resented as a claimant for priority, possibly one who "pretended not to have seen my writings." This was Domenico Passignani at Rome, to whom Galileo is said to have intended to give honorable mention in his published *Letters on Sunspots*.³⁰ Hence there were other men referred to in the pas-

²⁷ *Opere*, vi, 214; *Discoveries and Opinions*, 232.

²⁸ Scheiner's original letters on sunspots, written to Mark Welsler, had been published by the latter over the pseudonym "Apelles," as Scheiner's superior had forbidden him to jeopardize the reputation of his order by publishing observations that might be mistaken and were contrary to Aristotle. Although Galileo forbore in *Il Saggiatore* to refer directly to this *nom de plume*, a contemptuous reference to it had been made in 1619 in a book which Galileo was

known to have written, though it was published over the name of a pupil. Scheiner was exasperated at the time, and said that he would pay Galileo back in his own coin. See the *Opere*, vi, 47-48, and xii, 489.

²⁹ *Opere*, xi, 395, 418.

³⁰ As a matter of fact, Passignani very likely did discover sunspots independently shortly before Scheiner's first published observations are dated. He asked Galileo's friend Ludovico Cigoli to transmit his findings to the Florentine astronomer, and Cigoli's letter constitutes the

sage that offended Scheiner; and indeed, Galileo's repeated plurals in that passage, his "many," his "others," and his "some" could hardly all be taken as exaggerations by any reasonable person, as if they alluded over and over again to the lone Apelles. Nevertheless, so far as I know all writers on this topic have agreed with Strauss in believing open hostilities were here commenced by Galileo.³¹

Scheiner was not even right in saying that no others had written on the topic. In November, 1614, Galileo had received a visit at Florence from Jean Tarde, to whom he showed his sunspot data and with whom he discussed at length the dispute with Scheiner and his own conclusions. Tarde recorded the entire interview in his diary, and later acknowledged by letter the receipt of Galileo's *Letters on Sunspots*. But five years afterward he scratched out his entries about sunspots in the diary and proceeded to publish a book of his own on the subject. I have been unable to consult it, but the title of the work tells enough of the story for our present purposes.³² It appeared at Paris under the title *Borbonia sydera, id est planetae qui Solis lumina circumvolitant motu proprio ac regulari, falso hactenus ab helioscopis maculae Solis nuncupati*, etc. In 1623 the same author published a French translation and this time the title was still more specific: *Les Astres de Borbon et apologie pour le Soleil. Monstrant et vérifiant que les apparences qui se voient dans la face du Soleil sont des planètes et non des taches, comme quelques italiens et allemands observateurs d'icelles luy ont imposé*. The irony of it is that Tarde's publication was plagiarism of Scheiner's idea rather than Galileo's, and that he had added insult to injury by attributing to this "allemand observateur," inventor of the "helioscope," the notion that they were not stars but spots. In overlooking this writer, Scheiner had neglected a worse foe than Galileo.

A complete account of the tragic enmity between these two men would go far beyond the scope of this paper. It suffices to have indicated that there was probably no violent attack intentionally directed against either man by the other until 1630. Despite the assumptions of many writers on the subject, there seems only to have existed a long-smoldering fire which suddenly erupted into a blaze of destruction. The well-informed Gabriel Naudé was convinced that Galileo's final downfall was the work of Scheiner,³³ and despite the fact that no other Jesuit was responsibly named by any other writer of that period, the Jesuits have ever since received the brunt of it. It is interesting to reflect that the innocent cause of the final debacle may have been the long-dead Francesco Sizzi, whom Galileo had once defended before the Jesuit fathers at the Roman College.

first mention of sunspots in the surviving correspondence. From Galileo's reply, however, it is fairly apparent that sunspots were nothing new to him; and it may be that Passignani observed them only because Galileo had aroused interest in the subject while at Rome a few months before. At any rate, when Passignani later insisted loudly that it was his discovery, Galileo reversed his intention to mention him. See the *Opere*, xi, 208-209, 212-214, 253, 268, 276-277, 348.

³¹ Even Favaro neglected to differentiate the various persons who were probably intended, and sought a justification for this attack as if it all applied to Scheiner (*Oppositori*, p. 72).

³² Concerning Tarde see Favaro, Di Giovanni Tarde e di una sua visita a Galileo dal 12 al 15 novembre 1614, *Bullettino di bibliografia e di storia delle scienze matematiche e fisiche*, 1887, Tomo 20, 345-371.

³³ *Opere*, xv, 88, 164.