*WINIFRED LOVELL WISAN**

ON ARGUMENT *EX SUPPOSITIONE FALSA*

> In my opinion it cannot be denied but that your discourse carries with it much of probability, arguing, as we say, *ex suppositione*, namely, granting that the Earth moves with the two motions assigned it by Copernicus; but, if one excludes those motions, all that you have said is vain and invalid; and for the exclusion of that hypothesis, it is very manifestly hinted by your discourse itself.[1]

THUS speaks Simplicio to Salviati in Galileo's *Dialogue on the Great World Systems*. Simplicio continues with what he believes to be conclusive arguments against the Copernican system. If, for example, the Earth rotates, surely one consequence is that we would feel strong winds as we move through the air, which Simplicio assumes would remain stationary while the Earth moves. Since we don't feel these winds, the antecedent supposition must be false, according to Simplicio. Therefore, it follows that the Earth does not move.

To the uninitiated, then, it appears that Simplicio is here accusing Salviati of reasoning *ex suppositione* from an unconvincing (indeed, false) hypothesis, which would seem to be easily disproved. According to Donald W. Mertz, however, this is not the case. Simplicio's remark is simply a muddled reference to Galileo's standard argument *ex suppositione*, which, according to Mertz' analysis, conclusively demonstrates *verae causae*, and which any sophisticated reader of that time would understand.[2] Hence, it is not even necessary for Salviati to point this out. He simply goes on to other arguments which, hopefully, the slow-witted Aristotelian will comprehend better.

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Received 20 *July* 83, *accepted in revised form* 10 *December* 83.

[1] *Le Opere di Galileo Galilei*, 20 vols., A. Favaro (ed.) (Florence: Barbèra, 1890–1909), Vol. VII, p. 462. I have followed the Salisbury translation of the *Dialogue on the Great World Systems*, rev., ann., with Introduction by G. de Santillana (University of Chicago Press, 1953), p. 443, with some alterations.

[2] Donald W. Mertz, 'The Concept of Structure in Galileo: Its Role in the Methods of Proportionality and *Ex Suppositione* as Applied to the Tides', *Studies in History and Philosophy of Science* **13** (1982) 111–113. The pioneering work on the existence of such a method in Galileo's writings is by William A. Wallace, who has discussed it in a number of papers. See, especially 'Galileo and Reasoning "*Ex Suppositione*": The Methodology of the Two New Sciences', *Boston Studies in the Philosophy of Science* **XXXII**, R. Cohen *et al.*, (eds.) (Dordrecht: D. Reidel, 1976), pp. 79–104; and *Prelude to Galileo* (Boston: Reidel, 1981), Chapter 8, pp. 129–159, p. 232, and n. 86, p. 242. This thesis has not been without critics. See my 'Galileo's Scientific Method: A Reexamination', in *New Perspectives on Galileo*, R. E. Butts and J. C. Pitt, (eds.) (Dordrecht: D. Reidel, 1978), pp. 44–45, and note 38 on pp. 53–54. For more extensive discussion, see Ernan McMullin, 'The Conception of Science in Galileo's Work', in the same volume, pp. 234–237. See, also, McMullin's review of Wallace's *Prelude* in *Philosophy of Science*, **50** (1983), pp. 171–173.

Stud. Hist. Phil. Sci., Vol. 15, No. 3, pp. 227–236, 1984. 0039–3681/84 $3.00 + 0.00
Printed in Great Britain.

According to Mertz' interpretation, Galileo's 'standard method of *ex suppositione*' goes as follows:

> If, if on the supposition of D, then D is proven related as a cause to C, and C obtains, then D.[3]

In this example, C stands for the phenomena of Mediterranean tides and D for the Copernican interpretation of the motions of the Earth. Mertz argues that, correctly understood, this is a valid deduction of the Copernican hypothesis by a method stemming from Aquinas, Buridan and others. The argument for validity is based on a number of assumptions. One involves use of the medieval method of resolution and composition. Another is Galileo's argument that if the Earth moves, this can be shown to be the efficient cause of the tides. But there is a rather gaping hole in Mertz' reconstruction. Let D be the statement: 'There are demons who can and desire to produce diseases', and C the statement: 'There are diseases'. By Mertz' version of argument *ex suppositione*, we have here a proof that there are demons who cause diseases, a proposition which most scholars would regard as patently false, or, at best, nonsense.

If, however, for the sake of argument, we fix the last difficulty by stipulating natural causes, and we accept the rest of Mertz' assumptions, there still remain three major difficulties with this interpretation of Galileo's method of arguing *ex suppositione*.

I. This method is assumed to be widely known by Galileo's readers; however, the literature on *ex suppositione* has yet to supply a single reference to any general discussion of the method by Galileo, his disciples, or other contemporaries. References to this method in Galileo are exclusively to what are supposed to be instances of its use, as illustrated by the above interpretation of the passage quoted from the *Dialogue*.

II. The illustrative instances, offered by Mertz, turn out to be less than compelling evidence for the existence of this supposed method. The above quoted passage in the *Dialogue* is a typical example. Why should we believe that Simplicio's own interpretation of Salviati's argument — that it is derived from a false hypothesis — is incorrect and that Simplicio has simply misunderstood a more recondite meaning that is so well known that this misunderstanding of it requires no correction, or even comment, by Salviati? Similar difficulties attend the rest of the instances used to document the existence of this method in Galileo's writings.

III. There are other instances, not discussed by the proponents of this interpretation, in which Galileo uses the expression *ex suppositione*, both in the vernacular and in the formal Latin, and in such manner as strongly to

[3]Mertz, *op. cit.*, p. 118.

suggest a quite different — and simpler — interpretation, while those instances which are put forth in support of this suppositious thesis can be shown to have been misunderstood.

To elaborate on point I, the absence of general discussion of a special method of *ex suppositione* in Galileo's time, this is particularly surprising in view of the Renaissance obsession with method.[4] Supposing there was a recognized method of argument *ex suppositione*, as reconstructed from Galileo's writings, it is very odd that there should be no general and readily available discussion in the literature. It is particularly strange that Galileo, who was not reticent in such matters, never explains this supposedly very crucial method of his. Surely, he would have thought to give it as much attention as he did, say, the method of analysis and synthesis, which he discusses in several places, even though he doesn't use it much except in his mathematical proofs, as in the Greek tradition.[5] Finally, why is argument *ex suppositione* not a prominent matter of discussion by Galileo's disciples? Is it mentioned at all? This is rather suspicious. So far, no proponent of the theory of a well known method of *ex suppositione* in the 17th century has provided a single reference to any general discussion of the method in that period. They give us only a few occurrences of the expression which, under duress, are made to yield their supposed meanings.

On point II — the uncompelling nature of the instances cited by Mertz and others to show that *ex suppositione*, as defined by these authors, was Galileo's standard method of apodictic argument — it should be noted that most of the examples discussed in the literature are from his later writings. In Galileo's *De motu antiquiora*, however, which was composed fairly early,[6] there are a number of instances where the term *suppositio* is used to refer to an arbitrary

[4]See Neal Gilbert, *Renaissance Concepts of Method* (New York: Columbia University Press, 1960). Pioneering work was done by many others, much of it in the nineteenth century. See Gilbert's extensive bibliography. On Galileo, see, especially, J. H. Randall, Jr., 'The Development of Scientific Method in the School of Padua', *Journal of the History of Ideas* **I** (1940), pp. 177–206.

[5]See my 'New Science of Motion: A study of Galileo's *De motu locali*', *Archive for History of Exact Sciences* **13**, Nos 2 and 3, pp. 103–306, 117–119, especially n. 5, and section 6.4. Randall's claims for the method of analysis and synthesis in Galileo's work stimulated my investigation of Galileo's method, and this in turn led me to study his so-called *frammenti*, a selection of notes from his manuscript on motion (Galileo Manuscript 72, at the *Biblioteca Nazionale* in Florence). After completing this study of the *De motu locali*, from which it appeared that the method of analysis and synthesis did not, in fact, play a prominent role in Galileo's work, I returned to an earlier draft which examined Galileo's method in all of his published (and some unpublished) writings. The fruit of this labor was 'Galileo's Scientific Method: A Reexamination', in *New Perspectives on Galileo*, R. E. Butts and J. C. Pitt (eds.) (Dordrecht: D. Reidel, 1978), pp. 1–57. A few results appeared earlier in my 'Galileo Revisited: an Essay Review of *Galileo's Intellectual Revolution: Middle Period, 1610–1632*', in *Historia Mathematica* **3** (1976), 103.

[6]*Opere* I, pp. 251–340. These writings are generally thought to date from Galileo's years at Pisa, with perhaps some composed during his first years at Padua.

assumption which may be false, and, in at least one instance, we find the expression *ex suppositione* where the reference is to a supposition made in order to demonstrate (by *reductio ad absurdum*) that it is false.[7] The latter usage is rare in Galileo's writings, whereas the former — employment of an unproved, or unprovable, *suppositio* that may be false — is more frequent.

This usage remains unchanged in Galileo's later writings, including those which have been cited in support of the thesis Mertz defends in his paper: that Galileo used a method of arguing *ex suppositione* that produced rigorous demonstration of true conclusions. Let us look at four of these instances. The first is in the introduction to the second book of *De motu locali*,[8] on naturally accelerated motion. Referring explicitly to Archimedes, Galileo speaks of those who have derived spiral and conchoidal lines *ex suppositione* from certain motions that are not found in nature, and he *contrasts* with this procedure the one he will follow:

> . . . anyone may invent an arbitrary type of motion and discuss its properties (thus, for instance, some have imagined spiral or conchoidal lines, generated by certain motions, and have commendably established their properties arguing *ex suppositione*, although these motions do not occur in nature), but we have decided to consider the phenomena of bodies falling with an acceleration such as actually occurs in nature....[9]

The *De motu locali* is to be based on a definition of naturally accelerated motion as it occurs in nature. This definition (proportionality of velocity to time in free fall) was found through long reflection, according to Galileo, and the properties demonstrated from it are seen to correspond to and coincide with those properties which '*naturalia experimenta* show to the senses'.[10] Galileo speaks here of nature acting in the simplest, most evident way, and he concludes that we will not depart from right reason (*recto ratione*) if we accept his definition.

The definition is then stated formally, after which it is supported by several arguments. These follow from the principle of simplicity, from experience, and from argument that the most plausible alternative (that acquired velocity

[7] *Opere* I, p. 265.

[8] This is the title of Galileo's treatise on motion which is included as the *terza giornata* of *Discorsi e dimostrazioni matematiche intorno à due nuove scienze, Opere* VIII, pp. 190–313.

[9] *Op. cit.*, p. 197. My translation within parentheses; remainder from translation by Crew and DeSalvio (1914).

[10] *Ibid.* My translation.

is proportional to distance of fall) leads to a contradiction. This is all very much in a long tradition of the mathematical sciences from Euclid to Ptolemy.[11]

There is no hint here that Galileo's method is that of *ex suppositione* as recently expounded by Mertz and others. He is contrasting his own method with that followed by Archimedes, who, in his treatise on spiral motions, has supposed certain motions not found in nature. There are ambiguities in this discussion, but it is clear enough that Galileo is trying to present his definition as in some sense immediately evident.[12] He appeals to ancient custom

> in those sciences where mathematical demonstrations are applied to natural phenomena (*conclusioni naturali*), as is seen in perspective, astronomy, mechanics, music, and others which, with *sensate esperienze*, confirm their *principii*, which then become the foundations of the subsequent structure.[13]

This passage is often interpreted as illustrating Galileo's adherence to the hypothetico-deductive-experimental method. Isn't he, after all, confirming an hypothesis by deriving consequences from it and subjecting these consequences to experimental testing? What Galileo *says*, however, is that his principles (*principii*), once confirmed through sensate experience, become the foundation of the *seguente struttura*. As I have argued elsewhere, the fundamental principles of sciences modelled on mathematics are supposed established, not by experiment in the sense of confirming indirect consequences (that is, by hypothetico-deductive method), but through immediate experience.[14] In sciences such as astronomy, the situation is more complex, as will be explained below.

Galileo's most important statements about his method in the mathematical sciences are in the first day of the *Discorsi*. These remarks are too much neglected by historians of his method. Here, Galileo emphasizes the necessity of immediate principles that are clear and evident. Sagredo is used to celebrate the 'Academician's' lucid explanations and use of reasons, observations, and *esperienze* which are common and familiar to everyone. Indeed, demonstrative

[11]Ptolemy, *Almagest* (trans. by R. C. Taliaferro) in *Great Books of the Western World*, Vol. 16 (Chicago: 1952), pp. 6–12; also, *L'Ottica di Claudio Tolomeo: da Eugenio Ammiraglio di Sicilia, scrittore del secolo XII. Ridotta in latino sovra la traduzione araba di un testo greco imperfetto*, Book III (Turin: 1885), especially p. 60–61, paraphrased with key phrases translated in Wisan, 'New Science of Motion', p. 125, n. 15.

[12]'New Science of Motion', especially pp. 120–125; 'Galileo's Scientific Method', especially pp. 37–45.

[13]*Opere* VIII, p. 212. My translation.

[14]See my 'Galileo's Scientific Method', note 2, especially pp. 36–42.

science 'springs from and grows out of *principii* well known, understood, and conceded by all'.[15]

Returning now to the introduction to the book on accelerated motion in *De motu locali*, there is no indication here that Galileo is employing the recently defined method of *ex suppositione*. The argument characterized in this way assumes a motion that does not exist in nature, and there is no suggestion that this is how Galileo himself either reasons or argues here. Quite the contrary: Galileo is *contrasting* the method he is going to use with that of Archimedes, and it is Archimedes' argument that is *ex suppositione*.

Now, in Book III, on projectile motion, Galileo again speaks of arguing *ex suppositione* in the Archimedean sense. Here, however, Galileo will follow the example of Archimedes where the latter's suppositions have somewhat greater legitimacy than in the case of his spiral motions. Galileo's suppositions are invoked in reply to Sagredo's objections that the reasoning by which the parabolic path has been derived is *ex suppositione* in the pejorative sense. For Sagredo, that is, this reasoning, as in the case of Archimedes' spiral motions, depends on assumptions that are false in nature. Some of these assumptions simply ignore various impediments, such as air resistance. But one is more fundamental: since downward motion at each point of the trajectory is directed toward the center of the Earth and is not, then, along parallel lines, the path of a projectile cannot be truly parabolic.[16]

Salviati, appealing to a different text by Archimedes, fixes this last, and most serious, problem by supposing that projection takes place at an infinite distance from the center. This makes all plumb-lines parallel, and the path is

[15]*Opere* VIII, p. 131, quoted from translation by Crew and de Salvio. In a paper 'Galileo's Method of Causal Proportionality', *Studies in History and Philosophy of Science* **11** (1980), 229, Mertz suggests that what drew Galileo to mathematics was its relational character, and he opposes this to my suggestion that what attracted Galileo to mathematics was that logical certainty of results supposedly derived from true and evident principles. Now, Mertz is quite right that the relational character of mathematics is of dominant importance. Indeed, this is today considered its most fundamental characteristic. Our modern concept of mathematics, however, is quite different from that of the early modern period. Galileo explains his views clearly, and they are not those of the twentieth century Bourbaki. Moreover, his use of the methods of agreement and difference and of concomitant variations in his argument for the Earth's motion from the tides has more in common with Bacon's writings on method than with anything that can be found in the mathematics of the time. See my 'Galileo's Scientific Method', cited in n. 2, above, pp. 47–48 (n. 3); also, pp. 19, 49 (n. 12).

In Mertz' paper on 'The Concepts of Structure in Galileo' (cited in n. 2, above), he develops an historically more insightful line of analysis based on the principle that 'the structure of a complex effect is isomorphic by causation with the structure of its complex cause' (p. 124). This permits deeper explanation of the argument from the tides which goes beyond its Baconian structure. A similar reconstruction of the proof for the times-squared law does not square with Galileo's own account of what he is doing. However, it is possible that some such unarticulated principle does reinforce Galileo's reasoning in these passages and elsewhere, as Mertz suggests.

[16]*De motu locali*, Book III (*Opere* VIII, p. 273).

truly parabolic. Here, again, Galileo rejects characterization of his reasoning (by Sagredo) as *ex suppositione*, and argues instead that it follows from a *principio vero*.[17] One may, of course, quibble over the possibility of a removal to infinity, but if we grant this, then one has to concede Galileo's point. The motions near the Earth's surface that he assumes, unlike those of Archimedes, do exist in nature, and the path of a projectile would become truly parabolic if launched far enough from the Earth's center. Under this condition, his assumptions are true and his argument is not *ex suppositione* in the pejorative sense.

Galileo's critics, however, particularly in France where many results were disseminated before the *Discorsi* was published in 1638, began to question the truth of Galileo's fundamental principles. In a letter of 1637, to Pierre Carcavi, we find Galileo forced to retreat from his contention that his fundamental principle, that acquired velocity is directly proportional to time of fall, unlike Archimedes' assumptions in the treatise on spirals, is true in nature. To Carcavi, Galileo explains that:

> I argue *ex suppositione*, imagining for myself a motion towards a point that departs from rest and goes on accelerating, increasing its velocity with the same ratio as the time increases, and from such a motion I demonstrate conclusively [*io dimostro concludentemente*] many properties [*accidenti*]. I add further that if experience should show that such properties were found to be verified in the motion of heavy bodies descending naturally, we could without error affirm that this is the same motion I defined and supposed; and *even if not*, my demonstrations, founded on my supposition, lose nothing of their force and conclusiveness; just as nothing prejudices the conclusions demonstrated by Archimedes concerning the spiral that no moving body is found in nature that moves spirally in this way.[18] [Emphasis added in line 7.]

Here, at least, it is Galileo himself, not just Archimedes, who argues *ex suppositione* from a principle not fully evident in nature, and now he will wrap himself in the cloak of his Greek model. He proceeds to argue that the properties derived from his principle do, in fact, exist in nature and are verified by experiments. But, he hedges. Like Archimedes, Galileo argues *ex suppositione* from his definition (of naturally accelerated motion). If this turns out not to define that which actually occurs in nature, the *demonstrations* lose nothing just as 'nothing prejudices the conclusions demonstrated by Archimedes concerning the spiral that no moving body is found in nature that moves

[17] *Ibid.*, p. 274.

[18] *Opere* XVII, pp. 90–91, translation, with minor interpolations, from W. A. Wallace, *op. cit.*, n. 2, above, p. 87.

spirally in this way'.[19] Mathematically speaking, of course, it is irrelevant whether or not the motions assumed do actually exist in nature.

But this is a *volta face*. Despite what were probably good experimental results by this time,[20] Galileo has been forced to concede that the treatise on accelerated motion, like that of Archimedes on spirals, may not be true of motions in nature. Still, it's all good mathematics and its author could expect some measure of fame just from that. But (with, no doubt, an *eppure* under his breath), Galileo maintains that the motion defined does occur in nature. As he says elsewhere to Baliani,[21] he has been lucky, for the properties of the motions of heavy bodies do, in fact, correspond *puntualmente* to those demonstrated.

This, however, means that it is the consequences of his principles, not the principles themselves, that are confirmed by his demonstration. The principles, alas, do not meet the commonly accepted criteria as set forth in the first day of the *Discorsi*: they are not 'well known, understood, and conceded by all' (see page 232). Galileo's critics have forced him to admit that his argument from the proportionality between velocity and time, in free fall, is *ex suppositione*. Very well, then, his *De motu locali* is still a beautiful mathematical treatise like those of Archimedes.

This interpretation has been rejected by the advocates of a special apodictic method of arguing *ex suppositione* in Galileo's writings.[22] There remains,

[19]*Ibid.*

[20]The experiment recorded on folio 116t (Galileo Manuscript 72) failed. See my paper, 'Galileo and the Process of Scientific Creativity' (forthcoming in *Isis*). Later results from a simpler experiment along an inclined plane may have been much better. See Thomas B. Settle's very important paper, 'An Experiment in the History of Science', *Science*, **133** (1961), 19–23. His results have subsequently been corroborated by others.

[21]*Opere* XVIII, p. 13.

[22]W. A. Wallace's discussion of reasoning *ex suppositione* in an appendix to his *Prelude to Galileo* (cited in n. 2, above, pp. 150–159), shows deep misunderstanding, both of his critics and of Galileo. The issue is not whether Galileo's method was hypothetico-deductive (see both McMullin and myself, *op. cit.*, n. 2, above, for arguments *against* this interpretation). Nor is it whether Galileo's reasoning in connection with his new science of motion is lacking in 'the cogency attributed to it by the author' (*Prelude*, p. 150). It is whether that cogency is in any way connected with reasoning *ex suppositione*. Although Wallace admits that Galileo does not explicitly use the expression *ex suppositione* with regard to his definition of naturally accelerated motion in the *De motu locali*, he is nonetheless convinced that this is what Galileo intends. As I have argued above, and elsewhere, Galileo's text indicates quite the opposite. That is, his definition is presented, *not ex suppositione*, but as true in nature. There are difficulties, of course, about just how such principles as the definition of naturally accelerated motion can be known to be true. The hypothetico-deductive method of hypothesis, deduction, and experimental verification, eventually gained wide acceptance as a suitable way to establish principles. But, for Galileo, indirect confirmation of fundamental principles was not sufficient for a mathematical science, which must be based on true and immediately evident principles. This, of course, was impossible. Again, see my paper cited in mn. 2 and 5, above. With Galileo, the mathematical sciences go well beyond the ancient and medieval mechanics which could be more or less grounded on such principles. Galileo's new science of motion required new, non-evident principles. But, contrary to both Wallace and Mertz, Galileo did not employ argument *ex suppositione* to solve this problem.

however, a crucial but ignored passage which provides irrefutable evidence for the meaning of *ex suppositione*. And now we come to my third point. This clear and uncontrovertible instance where Galileo tells us exactly what he means by the disputed expression is nowhere discussed in the literature. The instance which shows most clearly what Galileo meant by argument *ex suppositione* appears in a draft written about 1615. In this draft, Galileo composed a reply to Bellarmine's letter to Foscarini early in 1615. In his letter, Bellarmine said, in effect, that proponents of the Copernican system must cease insisting upon its acceptance by the Church. Galileo's reply, apparently never sent, is published in his *Opere* under the title, *Considerazioni circa l'opinione Copernicano.*[23] The thrust of this document is that the Church should take care before condemning the Copernican system on the assumption that for Copernicus and his followers it is *ex suppositione* and not *vera de facto.*[24] This, according to Galileo, would be a serious mistake.

The *Considerazioni* includes an explanation of the two kinds of *suppositioni* used by astronomers. Some are *prime*, and these are regarded as of *assoluta verità in natura.*[25] Others are *seconde* and are imagined in order to save the appearances. These *seconde suppositioni* need only satisfy appearances and need not be taken as *re vera in natura.*[26] Ptolemy's fundamental suppositions (that the heavens are spherical and move circularly, that the earth is spherical, immobile, and at the center of the universe) are examples given by Galileo to illustrate *prime* suppositions. These were, indeed, widely regarded as firmly established and absolutely true. In fact, of course, they required a good deal of argument, mostly in the form of *reductio ad adsurdum*, but they did fit Aristotelian physics and were simpler and more immediate than the planetary hypotheses, with their epicycles, equants and eccentrics, which were regarded as more conjectural and merely to save the appearances. As Galileo puts it, these latter, the planetary hypotheses, which are more conjectural, are *un'altra sorte di suppositioni.*[27]

For Copernicus, however, according to Galileo, the hypotheses of the Earth's mobility, its motion about the Sun, and the motion of the other planets about the Sun, were primary, necessary, and true in nature, not simply postulated in order to save the appearances. We are told that, in fact, Copernicus, to do his calculations, returned to the old astronomy. In other words, the author of the *Revolutionibus* argued for the Sun-centered system solely because he believed it true in nature and not simply a convenient device for saving planetary hypotheses. Galileo elaborates at length on his concern

[23]*Opere* V, pp. 351 – 370.
[24]*Opere* V, p. 351.
[25]*Opere* V, p. 357.
[26]*Ibid.*
[27]*Ibid.*

that the Church not make the mistake of condemning the Copernican system on the false assumption that, for its author, it was not *vera de facto* but was made *ex suppositione*.

This very important and revealing remark, however, is not on page 357, often cited in the literature, but on page 351, which is ignored or glossed over by those who insist that Galileo's *metodo ex suppositione* achieved rigorous demonstration.[28] Yet, it is on page 351 that we find Galileo's clearest and most extensive remarks about argument *ex suppositione*. Such an argument, he says, is not intended to lead to factual truth, but it is based on assumptions made simply to save the appearances and to aid calculations. Moreover, as he says explicitly, it is false that, according to Copernicus and like minded astronomers, the stability of the Sun and the mobility of the Earth are taken *ex suppositione* simply to save the appearances and to aid calculations. On the contrary, they believe the Copernican system to be *vera de facto* and in nature. Galileo, of course, agrees entirely with this position. In the *Dialogue*, however, Simplicio does not. When he speaks of Salviati's argument as *ex suppositione*, he means that it follows from a false hypothesis and not from a supposition that is true in nature.

In conclusion, then, there is no evidence for, and there is much evidence against, the supposition that Galileo had an apodictic method of arguing *ex suppositione*, which he employed in his mature work. Simplicio's remark in the *Dialogue*, quoted at the beginning of this paper, must be taken to mean what it appears to mean, nothing more. He did not understand the new astronomy, but, given his assumptions, one must grant that even Simplicio could spot an argument *ex suppositione falsa*.

[28]Mertz nowhere cites this occurrence of *ex suppositione* in the *Considerazioni*, while Wallace insists that Galileo is here distinguishing between two different meanings of the expression. See *Prelude to Galileo*, cited in n. 2, above, p. 139 – 140. This is a misreading of the text. Galileo distinguishes between two different meanings of the common term, *suppositione* (that is, *prime* and *seconde*, p. 235, but he has only one meaning for argument *ex suppositione*, and this is that such an argument is from a supposition not known to be true.

On the page in *Considerazioni* that Wallace misreads (page 351) Galileo sets out to correct two *concetti* which are false (*diversi dal vero*). The first is that stability of the Earth and mobility of the sun are indubitable truths and that the contrary view is paradoxical and stupid. The second is that for Copernicus and his followers the Sun-centered system has been set forth *ex suppositione*, merely to save appearances and aid calculations. Galileo's only other use of the expression *ex suppositione* in the *Considerazioni* (p. 360) again refers to the erroneous belief of many that 'modern astronomers' (the Copernicans) introduced the motion of the Earth *ex suppositione* in order to save appearances. The *Considerazioni* ends with arguments that Copernicus was not the author of the preface to *De revolutionibus*, and that Copernicus himself believed the sun-centered system to be the true system.