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Galileo's Letter to the Grand Duchess Christina (1615)

(309) To the Most Serene Ladyship the Grand Duchess Dowager: ¹
[1]² As Your Most Serene Highness knows very well, a few years ago
I discovered in the heavens many particulars which had been invisible
until our time.³ Because of their novelty, and because of some conse-
quences deriving from them which contradict certain physical proposi-
tions⁴ commonly accepted in philosophical schools, they roused against
me no small number of such professors, as if I had placed these things
in heaven with my hands in order to confound nature and the sciences.⁵
These people seemed to forget that a multitude of truths contribute to
inquiry and to the growth and strength of disciplines rather than to their
diminution or destruction, and at the same time they showed greater
affection for their own opinions than for the true ones; thus they pro-
ceeded to deny and to try to nullify those novelties, about which the
senses themselves could have rendered them certain, if they had wanted
to look at those novelties carefully. To this end they produced various
matters, and they published some writings full of useless discussions
and sprinkled with quotations from the Holy Scripture, taken from pas-
sages which they do not properly understand and which they inappro-
priately adduce.⁶ This was a very serious error, and they might not have
fallen into it had they paid attention to St. Augustine's very useful advice
(310) concerning how to proceed with care in reaching definite deci-
sions about matters which are obscure and difficult to understand by
means of reason alone. For, speaking also about a particular physical

conclusion pertaining to heavenly bodies, he writes this (*On the Literal Interpretation of Genesis*, book 2, at the end):⁷ "Now then, always practicing a pious and serious moderation, we ought not to believe anything lightly about an obscure subject, lest we reject (out of love for our error) something which later may be truly shown not to be in any way contrary to the holy books of either the Old or New Testament."⁸

Then it developed that the passage of time disclosed to everyone the truths I had first pointed out, and, along with the truth of the matter, the difference in attitude between those who sincerely and without envy did not accept these discoveries as true and those who added emotional agitation to disbelief. Thus, just as those who were most competent in astronomical and physical science were convinced by my first announcement,⁹ so gradually there has been a calming down of all the others whose denials and doubts were not sustained by anything other than the unexpected novelty and the lack of opportunity to see them and to experience them with the senses. However, there are those who are rendered ill-disposed, not so much toward the things as much as toward the author, by the love of their first error and by some interest which they imagine having but which escapes me. Unable to deny them any longer, these people became silent about them; but, embittered more than before by what has mellowed and quieted the others, they divert their thinking to other fictions and try to harm me in other ways. These would not really worry me any more than I was disturbed by the other oppositions, which I always laughed off, certain of the result that the business would have; I should not worry if I did not see that the new calumnies and persecutions are not limited to matters of greater or less theoretical understanding, which are relatively unimportant, but that they go further and try to damage me with stains which I do abhor and must abhor more than death. Nor can I be satisfied that these charges be known as false only by those who know me and them; their falsity must be known to every other person. These people are aware that in my (311) astronomical and philosophical studies, on the question of the constitution of the world's parts, I hold that the sun is located at the center of the revolutions of the heavenly orbs and does not change place, and that the earth rotates on itself and moves around it. Moreover, they hear how I confirm this view not only by refuting Ptolemy's and Aristotle's arguments, but also by producing many for the other side, especially some pertaining to physical effects whose causes perhaps cannot be determined in any other way, and other astronomical ones dependent on many features of the new celestial discoveries; these dis-

coveries clearly confute the Ptolemaic system, and they agree admirably with this other position and confirm it. Now, these people are perhaps confounded by the known truth of the other propositions different from the ordinary which I hold, and so they may lack confidence to defend themselves as long as they remain in the philosophical field. Therefore, since they persist in their original self-appointed task of beating down me and my findings by every imaginable means, they have decided to try to shield the fallacies of their arguments with the cloak of simulated religiousness and with the authority of Holy Scripture, unintelligently using the latter for the confutation of arguments they neither understand nor have heard.

At first, they tried on their own to spread among common people the idea that such propositions are against Holy Scripture, and consequently damnable and heretical. Then they realized how by and large human nature is more inclined to join those ventures which result in the oppression of other people (even if unjustly) than those which result in their just improvement, and so it was not difficult for them to find someone who with unusual confidence did preach even from the pulpit that it is damnable and heretical;¹⁰ and this was done with little compassion and with little consideration of the injury not only to this doctrine and its followers, but also to mathematics and all mathematicians. Thus, having acquired more confidence, and with the vain hope that the seed which first took root in their insincere mind would grow into a tree and rise toward the sky, they are spreading among the people the rumor that it will shortly be declared heretical by the supreme authority. They also know that such a declaration not only would uproot these two conclusions, but also would render damnable all the other astronomical and physical observations and propositions (312) which correspond and are necessarily connected with them; hence, they alleviate their task as much as they can by making it look, at least among common people, as if this opinion were new and especially mine, pretending not to know that Nicolaus Copernicus was its author or rather its reformer and confirmer.¹¹ Now, Copernicus was not only a Catholic but also a clergyman and a canon, and he was so highly regarded that he was called to Rome¹² from the remotest parts of Germany¹³ when under Leo X the Lateran Council was discussing the reform of the ecclesiastical calendar; at that time this reform remained unfinished only because there was still no exact knowledge of the precise length of the year and the lunar month. Thus he was charged by the Bishop of Fossombrone,¹⁴ who was then supervising this undertaking, to try by repeated studies

and efforts to acquire more understanding and certainty about those celestial motions; and so he undertook this study, and, by truly Herculean labor and by his admirable mind, he made so much progress in this science and acquired such an exact knowledge of the periods of celestial motions that he earned the title of supreme astronomer; then in accordance with his doctrine not only was the calendar regularized,¹⁵ but tables of all planetary motions were constructed. Having expounded this doctrine in six parts, he published it at the request of the Cardinal of Capua¹⁶ and the Bishop of Kulm;¹⁷ and since he had undertaken this task and these labors on orders from the Supreme Pontiff, he dedicated his book *On Heavenly Revolutions* to the successor of the latter, Paul III. Once printed this book was accepted by the Holy Church, and it was read and studied all over the world without anyone ever having had the least scruple about its doctrine.¹⁸ Finally, now that one is discovering how well founded upon clear observations and necessary demonstrations¹⁹ this doctrine is, some persons come along who, without having even seen the book, give its author the reward of so much work by trying to have him declared a heretic; this they do only in order to satisfy their special animosity, groundlessly conceived (313) against someone else who has no greater connection with Copernicus than the endorsement of his doctrine.

Now, in matters of religion and reputation I have the greatest regard for how common people judge and view me; so, because of the false aspersions my enemies so unjustly try to cast upon me, I have thought it necessary to justify myself by discussing the details of what they produce to detest and abolish this opinion, in short, to declare it not just false but heretical. They always shield themselves with a simulated religious zeal, and they also try to involve Holy Scripture and to make it somehow subservient to their insincere objectives; against the intention of Scripture and the Holy Fathers (if I am not mistaken), they want to extend, not to say abuse, its authority, so that even for purely physical conclusions which are not matters of faith one must totally abandon the senses and demonstrative arguments in favor of any scriptural passage whose apparent words may contain a different indication. Here I hope to demonstrate that I proceed with much more pious and religious zeal than they when I propose not that this book should not be condemned, but that it should not be condemned without understanding, examining, or even seeing it, as they would like. This is especially true since the author never treats of matters pertaining to religion and faith, nor uses arguments dependent in any way on the authority of Holy Scripture, in

which case he might have interpreted it incorrectly; instead, he always limits himself to physical conclusions pertaining to celestial motions, and he treats of them with astronomical and geometrical demonstrations based above all on sensory experience and very accurate observations. He proceeded in this manner not because he did not pay any attention to the passages of Holy Scripture, but because he understood very well that (314) if his doctrine was demonstrated it could not contradict the properly interpreted Scripture. Hence, at the end of the dedication, speaking to the Supreme Pontiff, he says: "There may be triflers who though wholly ignorant of mathematics nevertheless abrogate the right to make judgements about it because of some passage in Scripture wrongly twisted to their purpose, and will dare to criticise and censure this undertaking of mine. I waste no time on them, and indeed I despise their judgement as thoughtless. For it is known that Lactantius, a distinguished writer in other ways but no mathematician, speaks very childishly about the shape of the Earth when he makes fun of those who reported that it has the shape of a globe. Mathematics is written for mathematicians, to whom this work of mine, if my judgement does not deceive me, will seem to be of value to the ecclesiastical Commonwealth over which your Holiness now holds dominion."²⁰

Of this sort are also those who try to argue that this author should be condemned, without examining him; and to show that this is not only legitimate but a good thing, they use the authority of Scripture, experts in sacred theology, and Sacred Councils. I feel reverence for these authorities and hold them supreme, so that I should consider it most reckless to want to contradict them when they are used in accordance with the purpose of the Holy Church; similarly, I do not think it is wrong to speak out when it seems that someone, out of personal interest, wants to use them in a way different from the holiest intention of the Holy Church. Thus, while also believing that my sincerity will become self-evident, I declare not only that I intend to submit freely to the correction of any errors in matters pertaining to religion which I may have committed in this essay due to my ignorance, but I also declare that on these subjects I do not wish to quarrel with anyone, even if the points are debatable. For my purpose is nothing but the following: if these reflections, which are far from my own profession, should contain (besides errors) anything that may lead someone to advance a useful caution for the Holy Church in her deliberations about the (315) Copernican system, then let it be accepted with whatever profit superiors will deem appropriate; if not, let my essay be torn up and burned,

for I do not intend or pretend to gain from it any advantage that is not pious or Catholic. Moreover, although I have heard with my own ears many of the things which I mention, I freely grant to whoever said them that they did not say them, if they so wish, and I admit that I may have misunderstood them; thus what I answer should not apply to them, but to whoever holds that opinion.

So the reason they advance to condemn the opinion of the earth's mobility and sun's stability is this: since in many places in Holy Scripture²¹ one reads that the sun moves and the earth stands still, and since Scripture can never lie or err, it follows as a necessary consequence that the opinion of those who want to assert the sun to be motionless and the earth moving is erroneous and damnable.

[2] The first thing to note about this argument is the following. It is most pious to say and most prudent to take for granted that Holy Scripture can never lie, as long as its true meaning has been grasped; but I do not think one can deny that this is frequently recondite and very different from what appears to be the literal meaning of the words. From this it follows that, if in interpreting it someone were to limit himself always to the pure literal meaning, and if the latter were wrong, then he could make Scripture appear to be full not only of contradictions and false propositions but also of serious heresies and blasphemies; for one would have to attribute to God feet, hands, eyes, and bodily sensations, as well as human feelings like anger, contrition, and hatred, and such conditions as the forgetfulness of things past and the ignorance of future ones. Since these propositions dictated by the Holy Spirit were expressed by the sacred writers in such a way as to accommodate the capacities of the very unrefined and undisciplined masses, for those who deserve to rise above the common people it is therefore necessary that wise interpreters (316) formulate the true meaning and indicate the specific reasons why it is expressed by such words. This doctrine is so commonplace and so definite among all theologians that it would be superfluous to present any testimony for it.

From this I think one can very reasonably deduce that, whenever the same Holy Scripture has seen fit to assert any physical conclusion (especially on matters that are abstruse and difficult to understand), it has followed the same rule, in order not to sow confusion into the minds of the common people and make them more obstinate against dogmas involving higher mysteries. In fact, as I have said and as one can clearly see, for the sole purpose of accommodating popular understanding the Scripture has not abstained from concealing the most important truths,

attributing even to God characteristics that are contrary to or very far from His essence; given this, who will categorically maintain that in speaking incidentally of the earth, water, sun, or other created thing the Scripture has set aside such regard and has chosen to limit itself rigorously to the literal and narrow meanings of the words? This would be especially implausible when mentioning features of these created things which are very remote from popular understanding and not at all pertinent to the primary purpose of the Holy Writ, that is, to the worship of God and the salvation of souls.

Therefore, I think that in disputes about natural phenomena one must begin not with the authority of scriptural passages but with sensory experience and necessary demonstrations. For the Holy Scripture and nature derive equally from the Godhead, the former as the dictation of the Holy Spirit and the latter as the most obedient executrix of God's orders; moreover, to accommodate the understanding of the common people it is appropriate for Scripture to say many things that are different (in appearance and in regard to the literal meaning of the words) from the absolute truth; on the other hand, nature is inexorable and immutable, never violates the terms of the laws imposed upon her, and does not care whether or not her recondite reasons and ways of operating are disclosed to human understanding; (317) but not every scriptural assertion is bound to obligations as severe as every natural phenomenon; finally, God reveals Himself to us no less excellently in the effects of nature than in the sacred words of Scripture, as Tertullian perhaps meant when he said, "We postulate that God ought first to be known by nature, and afterward further known by doctrine—by nature through His works, by doctrine through official teaching" (*Against Marcion*, I.18);²² and so it seems that a natural phenomenon which is placed before our eyes by sensory experience or proved by necessary demonstrations should not be called into question, let alone condemned, on account of scriptural passages whose words appear to have a different meaning.

However, by this I do not wish to imply that one should not have the highest regard for passages of Holy Scripture; indeed, after becoming certain of some physical conclusions, we should use these as very appropriate aids to the correct interpretation of Scripture and to the investigation of the truths they must contain, for they are most true and agree with demonstrated truths. That is, I would say that the authority of Holy Scripture aims chiefly at persuading men about those articles and propositions which, surpassing all human reason, could not be discov-

ered by scientific research or by any other means than through the mouth of the Holy Spirit himself. Moreover, even in regard to those propositions which are not articles of faith, the authority of the same Holy Writ should have priority over the authority of any human writings containing pure narration or even probable reasons, but no demonstrative proofs; this principle should be considered appropriate and necessary inasmuch as divine wisdom surpasses all human judgment and speculation. However, I do not think one has to believe that the same God who has given us senses, language, and intellect would want to set aside the use of these and give us by other means the information we can acquire with them, so that we would deny our senses and reason even in the case of those physical conclusions which are placed before our eyes and intellect by our sensory experiences or by necessary demonstrations. This is especially implausible for those sciences discussed in Scripture to a very minor extent and (318) with disconnected statements; such is precisely the case of astronomy, so little of which is contained therein that one does not find there even the names of the planets, except for the sun,²³ the moon, and only once or twice Venus, under the name of Morning Star. Thus if the sacred authors had had in mind to teach people about the arrangement and motions of the heavenly bodies, and consequently to have us acquire this information from Holy Scripture, then, in my opinion, they would not have discussed so little of the topic—that is to say, almost nothing in comparison with the innumerable admirable conclusions which are contained and demonstrated in this science. Indeed, it is the opinion of the holiest and most learned Fathers that the writers of Holy Scripture not only did not pretend to teach us about the structure and motions of the heavens and the stars, and their shape, size, and distance, but that they deliberately refrained from doing so, even though they knew all these things very well. For example, one reads the following words in St. Augustine (*On the Literal Interpretation of Genesis*, book 2, chapter 9): “It is also customary to ask what one should believe about the shape and arrangement of heaven according to our Scripture. In fact, many people argue a great deal about these things, which with greater prudence our authors omitted, which are of no use for eternal life to those who study them, and (what is worse) which take up a great deal of time that ought to be spent on matters pertaining to salvation. For what does it matter to me whether heaven, like a sphere, completely surrounds the earth, which is balanced at the center of the universe, or whether like a discus it covers the earth on one side from above? However, since the issue here is the

authority of Scripture, let me repeat a point I have made more than once; that is, there is a danger that someone who does not understand the divine words may find in our books or infer from them something about these topics which seems to contradict received opinions, and then he might not believe at all the other useful things contained in its precepts, stories, and assertions; therefore, briefly, it should be said that our authors did know the truth about the shape of heaven, but the Spirit of God, which was speaking through them, did not want to teach men these things which are of no use to salvation.”²⁴ (The same opinion is found in Peter Lombard's *Book of Sentences*.) The same contempt which the sacred writers had for the investigation of such properties of heavenly bodies is repeated by St. Augustine in the following chapter 10, in regard to the question whether heaven should be thought to be in motion or standing still. He writes: “Some brethren have also advanced a question about the motion of heaven, (319) namely whether heaven moves or stands still. For if it moves, they say, how is it a firmament? But if it stands still, how do the stars which are thought to be fixed in it revolve from east to west, the northern ones completing shorter circuits near the pole, so that heaven seems to rotate like a sphere (if there is at the other end another pole invisible to us) or like a discus (if instead there is no other pole)? To them I answer that these things should be examined with very subtle and demanding arguments to determine truly whether or not it is so; but I do not have the time to undertake and pursue these investigations, nor should such time be available to those whom we desire to instruct for their salvation and for the needs and benefit of the Holy Church.”²⁵

Let us now come down from these matters to our particular point. We have seen that the Holy Spirit did not want to teach us whether heaven moves or stands still, nor whether its shape is spherical or like a discus or extended along a plane, nor whether the earth is located at its center or on one side. So it follows as a necessary consequence that the Holy Spirit also did not intend to teach us about other questions of the same kind and connected to those just mentioned in such a way that without knowing the truth about the former one cannot decide the latter, such as the question of the motion or rest of the earth or sun. But if the Holy Spirit deliberately avoided teaching us such propositions, inasmuch as they are of no relevance to His intention (that is, to our salvation), how can one now say that to hold this rather than that proposition on this topic is so important that one is a principle of faith and the other erroneous? Thus, can an opinion be both heretical and

irrelevant to the salvation of souls? Or can one say that the Holy Spirit chose not to teach us something relevant to our salvation? Here I would say what I heard from an ecclesiastical person in a very eminent position (Cardinal Baronio), namely that the intention of the Holy Spirit is to teach us how one goes to heaven and not how heaven goes.

But let us go back and examine the importance of necessary demonstrations and sensory experiences in conclusions about natural phenomena, and how much weight has been assigned to them by learned and holy theologians. Among hundreds of instances of such testimony we have the following. Near the beginning of his work *On Genesis* Pererius asserts: (320) "In treating of Moses' doctrine, one must take diligent care to completely avoid holding and saying positively and categorically anything which contradicts the decisive observations and reasons of philosophy or other disciplines; in fact, since all truths always agree with one another, the truth of Holy Scripture cannot be contrary to the true reasons and observations of human doctrines." And in St. Augustine (Letter to Marcellinus, section 7), one reads: "If, against the most manifest and reliable testimony of reason, anything be set up claiming to have the authority of the Holy Scriptures, he who does this does it through a misapprehension of what he has read and is setting up against the truth not the real meaning of Scripture, which he has failed to discover, but an opinion of his own; he alleges not what he has found in the Scriptures, but what he has found in himself as their interpreter."²⁶

Because of this, and because (as we said above) two truths cannot contradict one another, the task of a wise interpreter is to strive to fathom the true meaning of the sacred texts; this will undoubtedly agree with those physical conclusions of which we are already certain and sure through clear observations or necessary demonstrations. Indeed, besides saying (as we have) that, in many places Scripture is open to interpretations far removed from the literal meaning of the words, we should add that we cannot assert with certainty that all interpreters speak with divine inspiration since if this were so then there would be no disagreement among them about the meaning of the same passages; therefore, I should think it would be very prudent not to allow anyone to commit and in a way oblige scriptural passages to have to maintain the truth of any physical conclusions whose contrary could ever be proved to us by the senses and demonstrative and necessary reasons. Indeed, who wants the human mind put to death? Who is going to claim that everything in the world which is observable and knowable has al-

ready been seen and discovered? Perhaps those who on other occasions admit, quite correctly, that the things we know are a very small part of the things we do not know? Indeed, we also have it from the mouth of the Holy Spirit that "God hath delivered the world to their consideration, so that man cannot find out the work which God hath made from the beginning to the end" (Ecclesiastes, chapter 3);²⁷ so one must not, in my opinion, contradict this statement and block the way of freedom of philosophizing about things (321) of the world and of nature, as if they had all already been discovered and disclosed with certainty. Nor should it be considered rash to be dissatisfied with opinions which are almost universally accepted; nor should people become indignant if in a dispute about natural phenomena someone disagrees with the opinion they favor, especially in regard to problems which have been controversial for thousands of years among very great philosophers, such as the sun's rest and earth's motion. This opinion has been held by Pythagoras and his whole school, by Heraclides of Pontus, by Philolaus (teacher of Plato), and by Plato himself (as Aristotle and Plutarch mention); the latter writes in the "Life of Numa" that when Plato was old he said it was very absurd to believe otherwise. The same opinion was accepted by Aristarchus of Samos (as Archimedes tells us), by the mathematician Seleucus, by the philosopher Hicetas²⁸ (according to Cicero),²⁹ and by many others. Finally, it was amplified and confirmed with many observations and demonstrations by Nicolaus Copernicus. Furthermore, in the book *On Comets*, the very distinguished philosopher Seneca tells us that one should attempt to ascertain with the greatest diligence whether the daily rotation belongs to the heavens or to the earth.

Therefore, it would perhaps be wise and useful advice not to add without necessity to the articles pertaining to salvation and to the definition of the faith, against the firmness of which there is no danger that any valid and effective doctrine could ever emerge. If this is so, it would really cause confusion to add them upon request from persons about whom not only do we not know whether they speak with heavenly inspiration, but we clearly see that they are deficient in the intelligence necessary first to understand and then to criticize the demonstrations by which the most acute sciences proceed in confirming similar conclusions. However, if I may be allowed to state my opinion, I should say further that it would be more appropriate to the dignity and majesty of Holy Writ to take steps to ensure that not every superficial and vulgar writer can lend credibility to his writings (322) (very often based on worthless fabrications) by sprinkling them with scriptural passages;

these are often interpreted, or rather distorted, in ways which are as remote from the true intention of Scripture as they are ridiculously close to the aims of those who ostentatiously adorn their writings with them. Many examples of such an abuse could be adduced, but I shall limit myself to two which are not far from these astronomical subjects. One of them consists of the writings that were published against the Medicean planets, which I recently discovered, and against the existence of which many passages of Holy Scripture were advanced;³⁰ now that these planets can be seen by the whole world, I should very much like to hear in what new ways those same opponents interpret Scripture and excuse their blunder. The other example involves someone who has recently argued in print against astronomers and philosophers, to the effect that the moon does not receive its light from the sun but is itself luminous; ultimately he confirms, or rather convinces himself to be confirming, this fancy with various scriptural passages which he thinks could not be accounted for if his opinion were not true and necessary.³¹ Nevertheless, it is as clear as sunlight that the moon itself is dark.

It is thus obvious that, because these authors had not grasped the true meaning of Scripture, if they had commanded much authority they would have obliged it to compel others to hold as true conclusions repugnant to manifest reason and to the senses. This is an abuse which I hope God will prevent from taking root or gaining influence because it would in a short time require the prohibition of all ratiocinative sciences. In fact, the number of men ill-suited to understand adequately the Holy Scripture and the sciences is by nature much greater than the number of intelligent ones; thus the former, by superficially glancing through Scripture, would arrogate to themselves the authority of decreeing over all questions about nature in virtue of some word ill-understood by them and written by the sacred authors for some other purpose; nor could the small (323) number of the intelligent ones restrain the furious torrent of the others, who would find all the more followers, inasmuch as it is sweeter to be considered wise without study and labor than to wear oneself out unrelentingly in the pursuit of very arduous disciplines. However, we can render infinite thanks to the blessed God, whose benevolence frees us from this fear while it strips such persons of any authority. The deliberating, deciding, and decreeing about such important issues can be left to the excellent wisdom and goodness of very prudent Fathers and to the supreme authority of those who, guided by the Holy Spirit, can only behave in a holy manner and will not permit the irresponsibility of those others to gain influence. These sorts of men

are, in my opinion, those toward whom serious and saintly writers become angry, not without reason. For instance, referring to the Holy Scripture, St. Jerome writes: "The chatty old woman, the doting old man, and the wordy sophist, one and all take in hand the Scriptures, rend them in pieces and teach them before they have learned them. Some with brows knit and bombastic words, balanced one against the other, philosophize concerning the sacred writings among weak women. Others—I blush to say it—learn of women what they are to teach men; and as if even this were not enough, they boldly explain to others what they themselves by no means understand. I say nothing of persons who, like myself, have been familiar with secular literature before they have come to the study of the Holy Scriptures. Such men when they charm the popular ear by the finish of their style suppose every word they say to be a law of God. They do not deign to notice what Prophets and apostles have intended but they adapt conflicting passages to suit their own meaning, as if it were a grand way of teaching—and not rather the faultiest of all—to misinterpret a writer's views and to force the Scriptures reluctantly to do their will" (Letter 53, to Paulinus).³²

[3] Among such lay writers should not be numbered some theologians whom I regard as men of profound learning and of the holiest lifestyle, and whom I therefore hold in high esteem and reverence. However, I cannot deny having some qualms, which I consequently wish could be removed; for in disputes about natural phenomena they seem to claim the right to force others by means of the authority of Scripture to follow the opinion they think is most in accordance with its statements, and at the same time they believe they are not obliged to (324) answer observations and reasons to the contrary. As an explanation and a justification of this opinion of theirs, they say that theology is the queen of all the sciences and hence must not in any way lower herself to accommodate the principles of other less dignified disciplines subordinate to her; rather, these others must submit to her as to a supreme empress and change and revise their conclusions in accordance with theological rules and decrees; moreover, they add that whenever in the subordinate science there is a conclusion which is certain on the strength of demonstrations and observations, and which is repugnant to some other conclusion found in Scripture, the practitioners of that science must themselves undo their own demonstrations and disclose the fallacies of their own observations without help from theologians and scriptural experts; for, as stated, it is not proper to the dignity of theology to stoop to the investigation of the fallacies in the subordinate

sciences, but it is sufficient for it to determine the truth of a conclusion with absolute authority and with the certainty that it cannot err. Then they say that the physical conclusions in regard to which we must rely on Scripture, without glossing or interpreting it in nonliteral ways, are those of which Scripture always speaks in the same way and which all the Holy Fathers accept and interpret with the same meaning. Now, I happen to have some specific ideas on these claims, and I shall propose them in order to receive the proper advice from whoever is more competent than I in these subjects; I always defer to their judgment.

To begin with, I think one may fall into something of an equivocation if one does not distinguish the senses in which sacred theology is pre-eminent and worthy of the title of queen. For it could be such insofar as whatever is taught in all the other sciences is found explained and demonstrated in it by means of more excellent methods and more sublime principles, in the way that, for example, the rules for measuring fields and for accounting are better contained in Euclid's geometry and arithmetic³³ than they are (325) in the practices of surveyors and accountants; or else insofar as the topic on which theology focuses surpasses in dignity all the other topics which are the subject of the other sciences and also insofar as its teaching proceeds in more sublime ways. I do not believe that theologians who are acquainted with the other sciences can assert that theology deserves the royal title and authority in the first sense; I think no one will say that geometry, astronomy, music, and medicine are treated more excellently and exactly in the sacred books than in Archimedes, Ptolemy, Boethius, and Galen. So it seems that the royal preeminence belongs to it in the second sense, namely because of the eminence of the topic and because of the admirable teaching of divine revelation in conclusions which could not be learned by men in any other way and which concern chiefly the gaining of eternal bliss. Thus theology does deal with the loftiest divine contemplations and for this it does occupy the royal throne and command the highest authority; and it does not come down to the lower and humbler speculations of the inferior sciences, but rather (as stated above) it does not bother with them, inasmuch as they are irrelevant to salvation. If all this is so, then officials and experts of theology should not arrogate to themselves the authority to issue decrees in the professions they neither exercise nor study; for this would be the same as if an absolute prince, knowing he had unlimited power to issue orders and compel obedience, but being neither a physician nor an architect, wanted to direct medical treatment

and the construction of buildings, resulting in serious danger to the life of the unfortunate sick and in the obvious collapse of structures.

Furthermore, to require astronomers to endeavor to protect themselves against their own observations and demonstrations, namely to show that these are nothing but fallacies and sophisms, is to demand they do the impossible; for (326) that would be to require that they not only should not see what they see and not understand what they understand, but also that in their research they should find the contrary of what they find. That is, before they can do this, they should be shown how to manage having the lower faculties of the soul direct the higher ones, so that the imagination and the will could and would believe the contrary of what the intellect thinks. (I am still speaking of purely physical propositions which are not matters of faith, rather than of supernatural propositions which are articles of faith.) I should like to ask these very prudent Fathers to agree to examine very diligently the difference between debatable and demonstrative doctrines. Keeping firmly in mind the compelling power of necessary deductions, they should come to see more clearly that it is not within the power of the practitioners of demonstrative sciences to change opinion at will, choosing now this and now that one; that there is a great difference between giving orders to a mathematician or a philosopher and giving them to a merchant or a lawyer; and that demonstrated conclusions about natural and celestial phenomena cannot be changed with the same ease as opinions about what is or is not legitimate in a contract, in a rental, or in commerce. This difference has been completely recognized by the holy and very learned Fathers, as shown by their having made (327) a great effort to confute many philosophical arguments or, to be more exact, fallacies, and it may be explicitly read in some of them. In particular, we read the following words in St. Augustine (*On the Literal Interpretation of Genesis*, book 1, chapter 21): "There should be no doubt about the following: whenever the experts of this world can truly demonstrate something about natural phenomena, we should show it not to be contrary to our Scripture; but whenever in their books they teach something contrary to the Holy Writ, we should without any doubt hold it to be most false and also show this by any means we can; and in this way we should keep the faith of our Lord, in whom are hidden all the treasures of knowledge, in order not to be seduced by the verbosity of false philosophy or frightened by the superstition of fake religion."³⁴

These words imply, I think, the following doctrine: in the learned

books of worldly authors are contained some propositions about nature which are truly demonstrated and others which are simply taught; in regard to the former, the task of wise theologians is to show that they are not contrary to Holy Scripture; as for the latter (which are taught but not demonstrated with necessity), if they contain anything contrary to the Holy Writ, then they must be considered indubitably false and must be demonstrated such by every possible means. So physical conclusions which have been truly demonstrated should not be given a lower place than scriptural passages, but rather one should clarify how such passages do not contradict those conclusions; therefore, before condemning a physical proposition, one must show that it is not conclusively demonstrated. Furthermore, it is much more reasonable and natural that this be done not by those who hold it to be true, but by those who regard it as false; for the fallacies of an argument can be found much more easily by those who regard it as false than by those who think it is true and conclusive, and indeed here it will happen that the more the followers of a given opinion thumb through books, examine the arguments, repeat the observations, and check the experiments, the more they will be testing (328) their belief. In fact, Your Highness knows what happened to the late mathematician of the University of Pisa:³⁵ in his old age he undertook an examination of Copernicus's doctrine with the hope of being able to refute it solidly since he considered it false, even though he had never examined it; but it so happened that as soon as he understood its foundations, procedures, and demonstrations he became convinced of it, and he turned from opponent to very strong supporter. I could also name other mathematicians (e.g., Clavius) who, influenced by my recent discoveries, have admitted the necessity of changing the previous conception of the constitution of the world, since it can no longer stand up in any way.

It would be very easy to remove from the world the new opinion and doctrine if it were sufficient to shut the mouth of only one person; this is perhaps the belief of those who measure the judgments of others in terms of their own, and who thus think it is impossible that such an opinion can stand up and find followers. However, this business proceeds otherwise. For in order to accomplish that objective, it would be necessary not only to prohibit Copernicus's book and the writings of the other authors who follow the same doctrine, but also to ban all astronomical science completely; moreover, one would have to forbid men to look toward the heavens, so that they would not see that Mars

and Venus are sometimes very close to and sometimes very far from the earth (the difference being that the latter sometimes appears forty times greater than at other times and the former sixty times greater); nor should they be allowed to see the same Venus appear sometimes round and sometimes armed with very sharp horns³⁶ and many other observable phenomena which can in no way be adapted to the Ptolemaic system but provide very strong arguments for Copernicanism. At the moment, because of many new (329) observations and because of many scholars' contributions to its study, one is discovering daily that Copernicus's position is truer and truer and his doctrine firmer and firmer; so to prohibit Copernicus now, after being permitted for so many years when he was less widely followed and less well confirmed, would seem to me an encroachment on the truth and an attempt to step up its concealment and suppression in proportion to how much more it appears obvious and clear. Not to ban the whole book in its entirety, but to condemn as erroneous only this particular proposition, would cause greater harm to souls, if I am not mistaken; for it would expose them to the possibility of seeing the proof of a proposition which it would then be sinful to believe. To prohibit the entire science would be no different than to reject hundreds of statements from the Holy Writ, which teach us how the glory and the greatness of the supreme God are marvelously seen in all His works and by divine grace are read in the open book of the heavens. Nor should anyone think that the reading of the very lofty words written on those pages is completed by merely seeing the sun and the stars give off light, rise, and set, which is as far as the eyes of animals and common people reach; on the contrary, those pages contain such profound mysteries and such sublime concepts that the vigils, labors, and studies of hundreds of the sharpest minds in uninterrupted investigation for thousands of years have not yet completely fathomed them. Even idiots realize that what their eyes see when they look at the external appearance of a human body is very insignificant in comparison to the admirable contrivances found in it by a competent and diligent philosopher-anatomist when he investigates how so many muscles, tendons, nerves, and bones are used; when he examines the function of the heart and the other principal organs; when he searches for the seat of the vital faculties; when he observes the wonderful structures of the senses; and, with no end to his astonishment and curiosity, when he studies the location of the imagination, memory, (330) and reason. Likewise, what the unaided sense of sight shows is almost noth-