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The Complementary Nature Of Theology And Science: Fact Or Fiction?

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THE COMPLEMENTARY NATURE OF THEOLOGY AND SCIENCE:
FACT OR FICTION?

SUBMITTED IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR
GRADUATION WITH HONORS FROM THE MATHEMATICS DEPARTMENT

DEPARTMENT OF MATHEMATICS

BY

LESLEY MAE HOLMES
JULY 1, 1994
SIGNATURE PAGE

This thesis for honors recognition has been approved for the Department of Mathematics.

Director

Reader

Reader

Sept 94

Date
To my mother. Don’t be discouraged just because I graduated first--hang in there! I love you.
TIME LINE

1564 Birth

1592 Appointment as Chair of Mathematics at the University of Padua

1607 Publication of Instructions for the use of the Proportional compass

1610 Publication of Starry Messenger
Appointment as Chair of Mathematics and Philosophy to the Medicis in Florence

1611 Triumphant reception in Rome
Publication of Discourse on things that Float on Water
First attack against the motion of the earth on religious grounds by Aristotelians

1612 Controversy over the priority in the discovery of the sunspots

1613 Publication of Letters on Sunspots
Publication of Letter to Castelli

1614 Publication of enlarged version of Letter to Castelli as Letter to the Grand Duchess Christina

1615 Lorini forwards a copy of Letter to the Grand Duchess Christina to the Holy Office
Galileo returns to Rome with his theory of the tides as proof of Copernicanism

1616 General Congregation of the Index publishes a decree admonishing Galileo to treat Copernicanism as a hypothesis (Edict of 1616)

1618 Galileo sends his treatise on the tides to Archbishop Leopold of Austria

1623 Publication of The Assayer

1626 Galileo travels to Rome and meets with Pope Urban VIII who assures Galileo that he may speak of Copernicus’ heliocentric theory hypothetically

1630 Galileo finishes Dialogue on the Great World Systems
<table>
<thead>
<tr>
<th>Year</th>
<th>Event</th>
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<tbody>
<tr>
<td>1631</td>
<td>Printing begins on <em>Dialogue on the Great World Systems</em></td>
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</table>
| 1632 | February - First printed copies of *Dialogue on the Great World Systems* become available  
           August - Book is confiscated by the Holy Office  
           October - Galileo is summoned to Rome by the Inquisition |
| 1633 | February - Galileo travels to Rome  
           April - First interrogation by the Inquisition occurs  
           May - Galileo submits his written defense  
              Three days later Galileo is called for his final examination  
              The next day Galileo's sentence is read and he is presented with the formula of abjuration |
| 1634 | Galileo completes *Dialogue Concerning Two New Sciences* |
| 1642 | Death |
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chapter 1

introduction

The traditional stereotype of historical conflict between scientific knowledge and religious belief has long ago been abandoned—or so we are often assured. Unfortunately, those who assert this are wrong. The old stereotype is alive and well—society still sees Galileo as being threatened with torture by a malevolent Inquisition unless he renounces his scientific theories.

The trial of Galileo has been called the greatest scandal in Christendom. As such, it represents the so-called crack in the wall between theology and science. Consequently, I chose to examine the events leading up to the trial (and the trial itself) in an attempt to determine the nature of the relationship between theology and science.

The breakdown of the alliance between scientific study and Christian tradition during the seventeenth century must be examined at more than just face value. Common sense leads us to ask questions concerning the motivations behind this particular view of conflict between scientific and religious doctrine. Who put this view forward, who used it, and what (and whose) interests did it serve? More than likely, the hypothetical conflict between science and religion was fabricated as a means of silencing a startling and innovative new way of looking at the universe.

I want to suggest, therefore, that the classical points
of conflict in the historical relation of science and religion can be re-interpreted as conflicts between scientists of the old-school and those of the new, concerning the accuracy of proposed theories, particularly when the compatibility of these theories and of accepted biblical interpretation was in doubt.

While society may view the verdict of the trial of Galileo as a symbol of the Church's supposed rejection of scientific progress, I believe that the Church was used to muzzle Galileo by members of the Aristotelian scientific community. Contrary to long-standing mythology, science and theology are not enemies but partners.

chapter 2

Medieval scholasticism and scientific methodology

European life in the Middle Ages displayed a unifying web of religious beliefs and aspirations. Despite the multitude of political sovereignties, despite the limited contact between people of different lands, despite the barriers of caste and a host of other conditions of daily life which tended to divide and separate, the people shared a common faith that dominated the intellectual spirit of the time. Scholarship was possible primarily through support from the Church and, therefore, learning tended to center upon the interests of the same. The study and interpretation of texts of a philosophical nature occupied a
high place among scholarly pursuits, second only to purely religious texts. Hence, few practical problems of a physical nature were presented to scholars for consideration and solution, or indeed even came to their attention in any way. Philosophical problems of physics were the subject of much discussion, but the methods employed were that of logical arguments as applied to the opinions of ancient writers, rather than direct observation and investigation. Not the laws of nature, but only the divine will which underlay them, were discussed.

The pursuit of learning during the Middle Ages brought students into contact with teachers of great reputation in many European cities. These assemblies, which at first were informal gatherings of eager students in quest of specific instruction, gradually evolved into formal universities with the power to confer degrees and to accredit teachers. Although not controlled by the Church, the universities were predominantly staffed by churchmen and every professor was well-versed in church doctrines. Because scholars came to the universities from many different countries, and continually moved from one university to another, all instruction was given in Latin. Thus the universities had great influence in preserving the religious emphasis of scholarly researches, in resisting the intrusion of unorthodox doctrines, and in maintaining a separation of language between scholars and men in other walks of life.
With the beginning of the Renaissance, rifts appeared in the unity of medieval intellectual life. Preoccupation with religious matters began to give way before the wonders of reported explorations and discoveries. Intellectual interests and the desire for knowledge began to spread beyond the circles of professional scholars into those of the nobility and rising merchant (or middle) class. Men of culture generally became curious about the origins of familiar things and the nature of alien ones. Even before the so-called split between science and religion occurred, a diversion of intellectual interest from God and his word into man and his works had taken place in the ranks of scholars. This humanist movement was neither hostile to, nor irreconcilable with, Christian theology; it was simply the opening of a new outlet for intellectual thought. Yet with its birth, the monopoly of theology and philosophy upon the minds of men, so to speak, was broken. Humanism captured the imagination of a large proportion of scholars at that time, undermining the power of religious institutions of that time period.

Anything related to man was considered a legitimate object of research—his artistic nature as well as his philosophical, his literary as well as his political history. Music, architecture, sculpture, and painting found new life in activities independent of the church.

Additionally, the scientific mind of the Middle Ages
was dominated by five ideas: (1) the traditional acceptance of old facts which were taken for granted, (2) a disposition to build up logical theories on those old facts, and improve upon these theories, but not to question these theories at their roots, (3) reverence for philosophical authority as the starting point of science, especially of Aristotle, (4) a spirit of contentment with present knowledge, and finally, (5) traditional interpretation of Scripture was taken as an authority not only in theology but also in science.

During the Middle Ages, few, if any, experiments were performed to verify the prevailing scientific theories of the time--those of Aristotle. Rather than empirically verify that what Aristotle predicted was an actuality, scientists would debate over whether the reasoning behind his laws was logical. The Aristotelian view of the universe was not tested empirically in a laboratory, rather, it was philosophically debated in a classroom. Consequently, no concrete proof that the universe was geocentric, or earth-centered, existed. Scholars simply accepted the geocentric theory as correct, based on the fact that Aristotle's reasoning appeared to be logical. Furthermore, scriptural interpretation of the time supported the idea that the earth stood still while the sun (and the surrounding heavens) moved.
Early years

Into this atmosphere of change, Galileo Galilei was born in 1564 and died in 1642, the year that Newton was born. His father, Vincento Galilei, was a man of remarkable culture, with considerable achievements as a composer and writer of music.

The early portraits of Galileo show a ginger-haired young man with an arrogant stare. He first attended the Jesuit school at the Monastery of Vallombrosa, near Florence; but Vincento wanted him to become a merchant and brought Galileo back home to Pisa; then, in recognition of Galileo’s obvious gifts, Vincento once again changed his mind and at seventeen sent Galileo to the local university at Pisa to study medicine. Vincento had four other children to look after, and since the University fees were high, Vincento tried to obtain a scholarship for Galileo. Although there were forty scholarships for poor students available at Pisa, Galileo failed to obtain one, and was compelled to leave the University without a degree.

Back home Galileo continued his studies, mostly in applied mechanics, perfecting his ability in making mechanical instruments and gadgets. He invented a hydrostatic balance, wrote a treatise on it which he circulated in manuscript, and began to attract the attention of scholars. Among these was the Marchese Guidobaldo del
Monte who recommended Galileo to his brother-in-law, Cardinal del Monte, who in turn recommended him to Ferdinand de Medici, the ruling Duke of Tuscany. As a result, Galileo was appointed a lecturer in mathematics at the University of Pisa, four years after that same University had refused him a Scholarship. Thus, at the age of twenty-five, Galileo was launched on his academic career. Three years later, in 1592, he was appointed to the vacant Chair of Mathematics at the famous University of Padua.

Galileo remained in Padua for eighteen years, the most creative and fertile years of his life. It was here that he laid the foundations of modern dynamics, the science concerned with moving bodies. But the results of this research he published only towards the end of his life. Up to the age of forty-six, when the Starry Messenger was launched into the scientific community, Galileo had published no scientific work. His growing reputation in this period, before his discoveries through the telescope, rested partly on treatises and lectures circulated in manuscript, partly on his mechanical inventions and partly on the instruments which he manufactured in his own workshop. Galileo’s truly great discoveries—such as the laws of motion of falling bodies and projectiles—and his ideas on cosmology, however, he kept strictly to himself and for his private correspondents.

Why did Galileo wait so long to publish his opinions?
He had, at the time, no reason to fear religious persecution. The Lutherans, not the Catholics, had been the first to attack the Copernican system—which never prevented Kepler from defending it in public. Twenty years after its publication, the Council of Trent re-defined Church doctrine and policy in all its aspects, but it had nothing to say against the heliocentric system of the universe. Galileo himself enjoyed the active support of several Cardinals, including the future Urban VIII, and of the leading astronomers among the Jesuit Order. Up until the fateful year 1616, discussion of the Copernican system was not only permitted, but encouraged—under the provision that it should be discussed as a scientific hypothesis, and should not encroach upon theological matters.

Thus legend and hindsight combined to distort the picture, and given rise to the mistaken belief that to defend the Copernican system as a working hypothesis entailed the risk of persecution or disfavor by the Church. During the first fifty years of Galileo's lifetime, no such risk existed; and the thought did not even occur to Galileo. What he feared is clearly stated in his letter to Kepler: to be mocked and derided.¹ Galileo was afraid of the ridicule both of the unlearned and the learned, but particularly of the latter: who still considered Aristotle and Ptolemy as absolute authority. And this fear, as will be seen, was

¹Galileo Galilei, letter to Johannes Kepler, 4 August 1597.
fully justified.

First dispute

Between 1600 and 1610, Galileo worked on his researches concerning free fall, the motion of projectiles, and the laws of the pendulum, but published nothing except a brochure containing instructions for the use of the military (or proportional) compass. This was an invention made in Germany some fifty years earlier, which Galileo improved, as he improved a number of other instruments whose existence had been known of for a long time. Out of this minor publication developed the first of the futile disputes which Galileo was to wage all his life.

The dispute began when a mathematician named Balthasar Capra published, a year after Galileo, another brochure of instructions for the use of the proportional compass. Both Galileo and Capra's pamphlets referred to the same subject, which interested only military engineers and technicians. Believing that Capra had borrowed from Galileo's Instructions without naming him, Galileo's fury knew no bounds. He published a pamphlet Against the Calumnies and Impostures of Balthasar Capra, etc., in which Capra was described as "a venom spitting basilisque,"2 "an educator who bred the young fruit on his poisoned soul with stinking

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ordure,"³ "a greedy vulture, swooping at the unborn young to tear its tender limbs to pieces,"⁴ and so on. He also obtained from the Venetian Court the confiscation, on the grounds of plagiarism, of Capra’s Instructions.

chapter 4

Starry Messenger

Another instrument which Galileo improved upon, but did not actually invent, was the telescope. Whether Galileo actually saw and handled one of the Dutch instruments brought to Italy is not important, for once the principle was known, lesser minds than Galileo’s could (and did) construct similar gadgets. Galileo must have felt his reputation threatened with the construction of the telescope by people other than himself, as he did in the affair of the military compass; but fortunately, this time his passion was diverted into more creative channels. He began feverishly to improve his telescope, and to aim it at the moon and stars, which previously had attracted him but little. Within the next eight months Galileo succeeded (in his own words): "by sparing neither labor nor expense, in constructing for myself an instrument so superior that objects seen through it appear magnified nearly a thousand times, and more than thirty times nearer than if viewed by

³Galilei, Against 17.
⁴Galilei, Against 17.
the natural powers of sight alone."⁵ The *Starry Messenger* was Galileo's first scientific publication, and it threw telescopic discoveries like a bomb into the arena of the learned world. The *Starry Messenger* not only contained news of heavenly bodies "which no mortal had seen before;"⁶ it was also written in a new, factual style which no scholar had employed before. Up until this time, scientific publications were written in the language of scholars—Latin. Not only did Galileo write in the language of the common man, which was Italian, he also wrote his pamphlet in such a manner so that the average person could follow (and comprehend) his theories and the logic behind them.

After the introductory passages, Galileo described his observations of the moon and stars. But the principal sensation he left to the end:

> There remains the matter which seems to me to deserve to be considered the most important in this work, namely, that I should disclose and publish to the world the occasion of discovering and observing four planets, never seen from the very beginning of the world to our own times.⁷

The four new planets were the four moons of Jupiter, and the reason Galileo attributed such importance to their discovery is explained in a somewhat veiled aside:

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⁷Galilei, *Siderius* 29.
Moreover, we have an excellent and exceedingly clear argument to put to rest the scruples of those who can tolerate the revolution of the planets about the sun in the Copernican system, but are so disturbed by the revelation of the single moon around the earth while both of them describe the annual orbit round the sun, that they consider this theory of the universe to be impossible.8

In other words, Galileo thought the main argument of the anti-Copernicans to be the impossibility of the moon’s composite motion around the earth, and with the earth around the sun; and further believed that this argument would be invalidated by the composite motion of the four moons of Jupiter. This comment was the only reference to Copernicus in the whole booklet, and it contained no explicit commitment. Moreover, Galileo ignored the fact that in the Tychonic system all the planets describe a composite motion around the sun and with the sun around the earth.

Yet when all is said and done, and all the holes are picked in Galileo’s first published text, its impact and significance still remain tremendous. Others had seen what Galileo saw, yet he was the first to publish what he saw, and to describe it in a language which made everybody sit up. The mountains and valleys of the moon confirmed the similarity between heavenly and earthly matter. The unsuspected number of invisible stars made an absurdity of the notion that they were created for man’s pleasure, since he could only see them aided by a machine. The Jupiter

8Galilei, Siderius 29.
moons did not prove that Copernicus was right, but they did further shake the belief that the earth was the center of the world around which everything turned.

Reaction from scientific community

The pamphlet aroused immediate controversy. Curiously, Copernicus' Book of Revolutions had created little stir for half a century, while on the other hand, Starry Messenger (which had only an indirect bearing on the issue), caused such an outburst of emotions. The main reason was, no doubt, its immense readability. Again, Galileo was the first to publish in Italian, and to use arguments which could be followed by the average person with relative ease.

To understand the adverse reactions within the small, academic world in his own country, one must also take into account the effect of Galileo's personality. Galileo had the rare gift of provoking enmity; cold, unrelenting hostility which genius plus arrogance minus humility creates among colleagues. Without knowledge of this personal background, the controversy which followed the publication of the Starry Messenger would remain inexplicable. The subject of the quarrel was not the significance of the Jupiter satellites, but of their existence—which some of Italy's most illustrious scholars flatly denied. These men may have been partially blinded by passion and prejudice, but they were not quite as narrow-minded as it may seem.
Galileo's telescope was the best available, but it was still a primitive instrument without fixed mountings, and with an extremely small visual field. The telescope needed skill and experience in handling, which none of the other scholars possessed. Sometimes, a fixed star appeared in duplicate. Moreover, Galileo himself was unable to explain how and why the thing worked; and the *Starry Messenger* was conspicuously silent on this point. Thus, it was not entirely unreasonable for the scholars to suspect that the blurred dots which appeared to the strained eye pressed to the spectacle-sized lens, might be optical illusions in the atmosphere, or somehow produced by the telescope itself. The whole controversy about optical illusions, haloes, reflections from luminous clouds, and about the unreliability of testimonies, inevitably reminds one of a similar controversy three hundred years later: the UFO's. Here, too, emotion and prejudice combine with technical difficulties against clear-cut conclusions. And here, too, it is not unreasonable for self-respecting scholars to refuse to look at the photographic evidence for fear of making fools of themselves.

Thus, while Galileo's discoveries had become the talk of the world, the scholars in his own country were, with a very few exceptions, hostile or skeptical. The first, and for some time the only, scholarly voice raised in public in defense of Galileo, was Johannes Kepler's. In the first few
days of April, 1610, the Emperor received a copy of the *Starry Messenger* which had just been published in Venice, and Kepler was permitted to look through it. On April 8, 1610, Kepler received a copy of his own from Galileo, accompanied by a request for his opinion. Although Kepler was not in a position to verify Galileo's disputed discoveries, for he had no telescope, he took Galileo's claims on trust. He did it enthusiastically and without hesitation.

The courier for Italy was to leave on April 19, 1610; in the eleven days at his disposal Kepler wrote his pamphlet *Conversation with the Starry Messenger* in the form of an open letter to Galileo. The letter was printed the next month in Prague, and an Italian translation appeared shortly afterwards in Florence. Kepler's pamphlet was precisely the support that Galileo needed at that moment. The weight of Kepler's authority played an important part in turning the tide of the battle in his favor. The undeniable fact that Kepler had expressly endorsed Galileo's claims persuaded some of Galileo's opponents, who had previously refused to take him seriously, to look for themselves through improved telescopes which were now becoming available.

On the other hand, there existed a powerful body of men whose hostility to Galileo never abated: the Aristotelians at the universities. The opposition of the human mind to change and its resistance to innovation are most clearly
demonstrated by professionals with a vested interest in tradition and in the monopoly of learning. Innovation is a double threat in the fact that it endangers academics’ authority, and it evokes the deeper fear that their whole, meticulously constructed intellectual edifice might collapse. In Galileo’s own words:

...There remain in opposition to my work some stern defenders of every minute argument of the Peripatetics [Aristotelians]. So far as I can see, their education consisted in being nourished from infancy on the opinion that philosophizing is and can be nothing but to make a comprehensive survey of the texts of Aristotle, that from divers passages they may quickly collect and throw together a great number of solutions to any proposed problem. They wish never to raise their eyes from these pages—as if this great book of the universe had been written to be read by nobody but Aristotle, and his eyes had been destined to see for all posterity.9

Again, Galileo shows his frustration with the blind scientific methodology of the Aristotelians. Galileo does not blame any of his troubles on opposition from the Church, rather, he realizes that any resistance that he is receiving is due to the Aristotelian’s reluctance to consider any scientific proposition other than those put forth by their beloved Aristotle. The only opposition that Galileo acknowledges is coming from the scientific community—not the Church.

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Reaction from the church

The *Starry Messenger* was published in March of 1610; in September of that same year, Galileo took up his new post as Chief Mathematician and Philosopher to the Medicis in Florence; the following spring (1611) he spent in Rome.

The visit to Rome was a triumph. Cardinal del monte wrote in a letter: "If we were still living under the ancient Republic of Rome, I verily believe that there would have been a column on the Capitol erected in Galileo’s honor." Pope Paul V received him in friendly audience, and the Jesuit Roman College honored him with various ceremonies which lasted a whole day. The chief mathematician and astronomer of the Jesuit Roman College, Father Clavius, who at first had laughed at the *Starry Messenger*, was now entirely converted; so were the other astronomers at the college, Fathers Grienberger, van Maelcote and Lembo. They not only accepted Galileo’s discoveries, but improved on his observations, particularly of Saturn and the phases of Venus. When the head of the college asked for their official opinion on the new discoveries, they unanimously confirmed them.

This confirmation was of utmost importance. The phases of Venus, confirmed by the Jesuit astronomers, were irrefutable proof that at least that planet revolved around the sun, that the Ptolemaic system had become obsolete, and

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10Cardinal del Monte, letter to Cosimo II, 31 May 1611.
that the choice now lay between Copernicus and Tycho Brahe.  
The Jesuit Order was the intellectual spearhead of the Catholic Church.  Jesuit astronomers everywhere in Europe began to support the Tychonic system as a half-way house to the Copernican. The Copernican system itself could be freely discussed and advocated as a working hypothesis, but it was unfavorably viewed to present it as an established truth, because it seemed so contrary to current interpretation of scripture--unless and until definite proof could be produced in its favor.

Within a brief period, Jesuit astronomers also confirmed the earthly nature of the moon, the existence of sunspots, and the fact that comets moved in outer space, beyond the moon. This resulted in the abandonment of the Aristotelian perfect and unchangeable nature of the celestial spheres. Thus the most influential intellectual order within the Catholic Church was at that time in full retreat from Aristotle and Ptolemy, and had taken up an intermediary position regarding Copernicus. 

chapter 5

Discourse on Things that Float on Water

After his return, in the summer of 1611, from his Roman triumph to Florence, Galileo became immediately involved in several disputes. He had published a treatise on Things that Float on Water--a title that sounds harmless enough.
But in this first work on modern hydrostatics, Galileo had embraced Archimedes' views that bodies float or sink according to their specific gravity, against the Aristotelian view that bodies float or sink depending on their shape. The Aristotelians were out at once in full cry. They were the more irate as Galileo, instead of letting the facts speak for themselves, employed his favorite trick of anticipating his opponents' arguments, building them up in a mock-serious manner, and then demolishing them with glee. Their leader was a certain Lodovico delle Colombe, meaning dove; hence the name pigeon-league by which Galileo called his opponents. The Aristotelians published four books in six months to refute the Discourse on Things that Float on Water, and the controversy went on for nearly three years. It ended in a complete defeat of the attackers.

chapter 6

Letters on Sunspots

The next year, 1612, brought a new controversy with more serious consequences. It concerned the sunspots. The affair started at Ingoldstadt in Bavaria. where Father Scheiner, a Jesuit astronomer of great repute, and his assistant Cysat, profiting from a thick mist, turned their telescope directly at the sun. It was Cysat's turn first, who to his amazement discovered several black spots on the
face of the sun.

After continued observations, Father Scheiner reported on his sensational discovery in several letters to Marcus Welser in Augsburg. Welser had the letter promptly printed, under the pseudonym "Apelles", as Scheiner had requested. Welser then sent the booklet to both Kepler and Galileo, for their opinions.

Kepler answered immediately. He recalled having himself observed a sunspot in 1607, about the size of a small black dot, which he had mistakenly assumed to be Mercury passing in front of the sun. He laughed at his mistake, then quoted reports of similar observations dating back to the days of Charlemagne; then gave his opinion that the spots were a kind of scum, due to the cooling of the sun in patches.

Galileo delayed his answer for more than three months, and then claimed the discovery for himself. He alleged having observed sunspots for about eighteen months, and having shown them a year before to many people in Rome, but did not name any of these witnesses. Thus Galileo’s claim was unjustifiable, firstly because Scheiner had been first to publish the discovery, and secondly because he could name

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On May 28, 1607, Kepler had observed the sun through a kind of improvised camera. It consisted in narrow gaps between the shingles on the roof of his house in Prague. On that particular day he observed on the projected disc of the sun a small, almost black dot. Kepler was convinced that the spot was the shadow of Mercury, and that he was observing a transit of that planet across the disc of the sun.
no witnesses, or correspondents, to prove it. But Galileo had come to regard telescopic discoveries as his exclusive monopoly--as he himself stated on a later occasion:

You cannot help it, Mr. Sarsi, that it was granted to me alone to discover all the new phenomena in the sky and nothing to anybody else. This is the truth which neither malice nor envy can suppress.  

By claiming priority in the discovery of sunspots, followed by disguised attacks on Father Scheiner, Galileo had made the first enemy among the Jesuit astronomers, and started the fatal process which would eventually turn the order against him.

Galileo followed his reply to Marcus Welser with two more Letters on Sunspots, which, the next year, were published under that title.

The Letters on Sunspots also contained Galileo's first printed statement in favor of the Copernican system. Up to this date (1613), Galileo had defended Copernicus in conversations at dinner tables, but never in print. The passage in question is on the last page of the Letters on Sunspots; it starts with a reference to the alleged moons of Saturn and continues:

And perhaps this planet also, no less than horned Venus, harmonizes admirably with the great Copernican system, to the universal revelation of which doctrine propitious breezes are now seen to be directed toward

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Here it was at last, the first public commitment to the Copernican system, though somewhat vague in form.

The \textit{Letters on Sunspots} won immediate and great popular acclaim. As far as the Church is concerned, not only was no voice raised in opposition, but Cardinals Borromeo and Barberini (the future Urban VIII) wrote letters to Galileo expressing their sincere admiration.

\textbf{chapter 7}

\textbf{First attack on religious grounds}

The first serious attack against Copernicanism on religious grounds came not from clerical quarters but from layman--none other than the previously mentioned delle Colombe, the leader of the so-called Pigeon League. His treatise \textit{Against the Motion of the Earth} contained a number of quotations from scripture to prove that the earth was in the center of the world. It was circulated in manuscript form in 1610 or 1611, before Galileo's public committal, and did not mention Galileo's name. Galileo himself was so little worried about a possible theological conflict, that he had let almost a year pass before he asked the opinion of his friend, Cardinal Conti, on the matter. The Cardinal
answered that, concerning the immutability of the skies, scripture seemed to favor Galileo's view rather than Aristotle's. As for Copernicus, annual motion of the earth was admissible, but daily rotation did not seem to agree with Scripture, unless it was assumed that certain passages must not be taken literally. Such an interpretation was permissible, however, "only in the case of the greatest necessity." 14

Necessity in this context meant once again: if and when convincing proof was shown of the reality of the earth's motion. But all this did not affect free discussion of the relative advantages of the Aristotelian, Tychonic or Copernican systems as mathematical hypotheses.

There the matter could have rested, and probably would have rested, except for Galileo's hypersensitivity to criticism. Towards the end of 1612, he was staying in the villa, near Florence, of his friend Filippo Salviati, 15 when some gossip reached him to the effect that a Dominican Father, Niccolo Lorini, had attacked his views in a private conversation. Galileo immediately wrote to Lorini, asking for an explanation. Lorini was seventy at the time, and professor of ecclesiastical history in Florence. He wrote back:

14 Conti, letter to Galileo Galilei, 7 July 1612.

15 Galileo immortalized his friend Salviati in his two great Dialogues
I have never dreamt of getting involved in such matters....I am at a loss to know what grounds there can be for such a suspicion, as this thing has never occurred to me. It is indeed true that I, not with a desire to argue, but merely to avoid giving the impression of a blockhead when the discussion was started by others, did say a few words just to show that I was alive. I said, as I still say, that this opinion of Ipernicus--or whatever his name is--would appear to be hostile to divine Scripture. But it is of little consequence to me, for I have other things to do....

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chapter 8

Galileo's reply: Letter to Castelli

The next year, 1613, brought about the publication of the Letters on Sunspots, and general public acclaim; including, as previously mentioned, the future Pope's. All was sunshine. Then another piece of gossip reached Galileo, this time from Pisa. It concerned an after-dinner conversation at Duke Cosimo's table. This incident was the beginning of what came to be known as the greatest scandal in Christendom.

Father Castelli, now professor of Mathematics at Pisa, had been invited to dinner at Court. The Duke's mother, the Dowager Duchess Christina of Lorraine, his wife Madeleine of Austria, and several other guests, among them Dr. Boscaglia, a professor of philosophy were present. The conversation was led by Madame Christina, who, during dinner, felt the

sudden urge to learn about the newly discovered moons of Jupiter. First she wanted to know their positions, then whether they were real or just illusions. Both Castelli and Boscaglia solemnly confirmed that they were real. Soon after that, dinner was over, and Father Castelli left.

But I had hardly come out of the palace when Madame Christina’s porter overtook me and told me that she wished me to return. [Castelli’s report to Galileo continued.]

Now before I tell you what ensued, you must first know that while we were at table, Dr. Boscaglia had the ear of Madame for a while; and conceding as true all the new things you have discovered in the sky, he said that only the motion of the earth had something incredible in it, and could not take place, in particular because Holy Scripture was obviously contrary to the view. Madame began, after some questions about myself, to argue Holy Scripture against me. Thereupon, after having made suitable disclaimers, I commenced to play the theologian and... carried things off like a palatine. Only Madame Christina remained against me, but from her manner I judged that she did this only to hear my answers. Professor Boscaglia never said a word.17

In subsequent letters, Castelli reported that Boscaglia had once more been defeated in debate, that even the Dowager had been won over, and that the subject had been dropped.

This, then, is the incident which touched off the drama. As on that previous occasion, when Lorini had remarked on "Ipernicus--or whatever his name is,"18 Galileo

17Galilei, Opere XI 151.
18Galilei, Opere XI 146.
was at once up in arms. His answer to the dinner-table small talk of the obscure Dr. Boscaglia (who is never heard of again) was a kind of theological atom bomb, whose radioactive fall-out is still being felt. It took the form of a Letter to Castelli, enlarged a year later into a Letter to the Grand Duchess Christina. Galileo’s answer was intended to be widely circulated, which indeed it was. His intent was to silence all theological objections to Copernicus. The result was the precise opposite: the letter became the principal cause of the prohibition of Copernicus, and of Galileo’s downfall.

It starts:

Some years ago, as Your Serene Highness well knows, I discovered in the heavens many things that had not been seen before our own age. The novelty of these things, as well as some consequences which followed from them in contradiction to the physical notions commonly held among academic philosophers, stirred up against me no small number of professors—as if I had placed these things in the sky with my own hands in order to upset nature and overturn the sciences. . . .

Showing a greater fondness for their own opinions than for truth, they sought to deny and disprove the new things which, if they had cared to look for themselves, their own senses would have demonstrated to them. To this end they hurled various charges and published numerous writings filled with vain arguments, and they made the grave mistake of sprinkling these with passages taken from places in the Bible which they failed to understand properly. . . .

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Galileo then developed the argument that certain statements in the Bible should not be taken literally because they were written in language "according to the capacity of the common people who are rude and unlearned."  

Hence, in expounding the Bible, if one were always to confine oneself to the unadorned grammatical meaning, one might fall into error. Not only contradictions and propositions far from true might thus be made to appear in the Bible, but even grave heresies and follies. Thus it would be necessary to assign to God feet, hands, and eyes, as well as corporeal and human affections, such as anger, repentance, hatred, and sometimes even the forgetting of things past and ignorance of those to come. . . For that reason it appears that nothing physical which sense-experience sets before our eyes, or which necessary demonstrations prove to us, ought to be called in question (much less condemned) upon the testimony of biblical passages which may have some different meaning beneath their words.  

In support of this idea, Galileo quoted at length St. Augustine as a witness—not realizing that, theologically, he was walking on extremely thin ice.  

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20 Galilei, Letter to G.D. 175. 
22 At the time of the controversy, Cardinal Bellarmine was one of the most respected theologians in Christendom, whose opinion carried more spiritual authority than Pope Paul V’s. But his lasting fame is that of one of the great controversialists of all time. His arguments against Lutheranism and Anglicanism were inspired by an overriding vision: The Universal Church as a super-state. The idea of the Universal Church demanded a Holy Father with a universal authority overriding that of any national ruler. However, Bellarmine was sufficiently realistic to moderate his claims of absolute power for the Papacy. In a later controversy between the Jesuit and Dominican Orders on the question of predestination, Bellarmine again took a middle line; the point is, however, that the Dominican Order’s arguments were mainly based on
passage where one can almost hear the ice cracking under his feet:

... I question whether there is not some equivocation in failing to specify the virtues which entitle sacred theology to the title of 'queen.' It might deserve that name by reason of including everything that is learned from all the other sciences and establishing everything by better methods and with profounder learning. ... Or theology might be queen because of being occupied with a subject which excels in dignity all the subjects which compose the other sciences, and because her teachings are divulged in more sublime ways.

That the title and authority of queen belongs to theology in the first sense, I think will not be affirmed by theologians who have any skill in the other sciences. None of these, I think, will say that geometry, astronomy, music, and medicine are more excellently contained in the Bible than they are in the books of Archimedes, Ptolemy, Boethius, and Galen. Hence, it seems likely that regal pre-eminence is given to theology in the second sense; that is, by reason of its subject and the miraculous communication, by divine revelation, of conclusions which could not be conceived by men in any other way, concerning chiefly the attainment of eternal blessedness.

Let us grant then that theology is conversant with the loftiest divine contemplation, and occupies the regal throne among the sciences by this dignity. But acquiring the highest authority in this way, if she does not descend to the lower and humbler speculations of the subordinate sciences and has no regard for them because they are not concerned with blessedness, then her professors should not arrogate to themselves the authority to decide on controversies on professions which they have neither studied nor practiced. Why, this

Augustine's, so that the saint's opinions had become a very controversial subject. Galileo's innocent reliance on Augustine's authority shows how unwise it was for a layman to venture out into the highly charged air of theology.
would be as if an absolute despot, being neither a physician nor an architect, but knowing himself free to command, should undertake to administer medicines and erect buildings according to his whim—at grave peril of his poor patients' lives, and the speedy collapse of his edifices. . . .

After invoking Augustine's authority once more, Galileo draws a distinction between scientific propositions which are soundly demonstrated (i.e., proven) and others which are merely stated. If propositions of the first kind contradict the apparent meaning of passages in the Bible, then, according to theological practice, the meaning of these passages must be reinterpreted—as was done, for instance, with regard to the spherical shape of the earth. So far Galileo has stated the attitude of the Church correctly. His next comment, however, is decidedly incorrect; "And as to the propositions which are stated but not rigorously demonstrated, anything contrary to the Bible involved by them must be held undoubtably false and should be proved so by every possible means." 24

Burden of proof

Now this was demonstratably not the attitude of the Church. "Propositions which are stated but not rigorously demonstrated," 25 such as the Copernican system itself, were

not condemned outright if they seemed to contradict Holy Scripture; they were merely relegated to the rank of working hypotheses, with an implied: 'wait and see; if you bring proof, then, but only then, we shall have to reinterpret Scripture in the light of this necessity.' But Galileo did not want to bear the burden of proof; for the crux of the matter is that he had no proof. Therefore, he conjured up an artificial black-or-white alternative by pretending that a proposition must either be accepted or outright condemned. The purpose of this sleight of hand becomes evident from the next sentence:

Now if truly demonstrated physical conclusions need not be subordinated to biblical passages, but the latter must rather be shown not to interfere with the former, then before a physical proposition is condemned it must be shown to be not rigorously demonstrated—and this is to be done not by those who hold the proposition to be true, but by those who judge it to be false. This seems very reasonable and natural, for those who believe an argument to be false may much more easily find the fallacies in it than men who consider it to be true and conclusive. . . 26

The burden of proof has been shifted. The significant words are those in bold. It is no longer Galileo's task to prove the Copernican system, but the theologians' task to disprove it. If they don't, their case will go by default, and Scripture must be reinterpreted.

In fact, however, there had never been any question of

26Galilei, Letter to G.D. 194.
condemning the Copernican system as a working hypothesis. The biblical objections were raised only against the claim that it was more than a hypothesis, that it was rigorously proven, that it was in fact equivalent to gospel truth. The subtlety in Galileo's maneuver is that he does not explicitly raise this claim. He cannot do so, for he had not produced a single argument in support of it. Galileo needed his black-or-white alternative as a first move: to distract attention from the true status of the Copernican system as an officially tolerated working hypothesis awaiting proof. Instead, by slipping in the ambiguous words "physical proposition" at the beginning, followed by the demand that "it must be shown to be not rigorously demonstrated," he implied (although did not dare to state it explicitly) that the truth of the system was rigorously demonstrated.

Throughout the document Galileo completely evaded any astronomical or physical discussion of the Copernican system; he simply gave the impression that it was proven beyond a doubt. If he had talked to the point, instead of around it, he would have had to admit that Copernicus' forty-odd epicycles and eccentrics were not only not proven but a physical impossibility, a geometrical device and nothing else; that the absence of an annual parallax (i.e.

of any apparent shift in the position of the fixed stars), in spite of the new telescopic precision, weighed heavily against Copernicus; that the phases of Venus disproved Ptolemy, but not Tycho Brahe; and that all Galileo could claim for the Copernican hypothesis was that it described certain phenomena (but not all) more simply than Ptolemy.

What motivated Galileo to attempt to silence his opposition in such a roundabout manner? For almost fifty years of his life, Galileo had held his tongue about Copernicus, not out of fear of being burned at the stake, but to avoid academic unpopularity. When, carried away by sudden fame, he had at last committed himself, it became at once a matter of prestige to him. He had said that Copernicus was right, and whosoever said otherwise was deriding his authority as the foremost scholar of his time. That this was the central motivation of Galileo’s fight becomes increasingly evident. Galileo’s ill-fated endeavor to protect his prestige does not excuse his opponents; but it is relevant to the problem of whether the conflict was between Galileo’s scientific and theological beliefs or not.

Miracle of Joshua

The final section of the Letter to the Grand Duchess is devoted to the miracle of Joshua. Galileo first explains that the sun’s rotation around its axis is the cause of all planetary motion. "And just as if the motion of the heart
should cease in an animal, all other motions of its members 
would also cease, so if the rotation of the sun were to 
stop, the rotations of all the planets would stop too."\textsuperscript{29}
Thus he not only assumed, with Kepler, that annual 
revolutions of the planets were caused by the sun, but also 
their daily rotation around their axes—a hypothesis with no 
more rigorous proof than the analogy with the animal's 
heart. He then concludes that when Joshua cried: "Sun, 
stand thou still,"\textsuperscript{30} the sun stopped rotating, and the earth 
in consequence stopped both its annual and daily motion. 
But Galileo, who came so close to discovering the law of 
inertia, knew better than anybody that if the earth suddenly 
stopped dead in its track, mountains and cities would 
collapse like match-boxes; and even the most ignorant monk, 
who knew nothing about the principle of momentum, knew what 
happened when a ship ran against a rock. If the Bible was 
interpreted according to Ptolemy, the sudden stand-still of 
the sun would have no appreciable physical effect, and the 
miracle remained credible as miracles go. If it was 
interpreted according to Galileo, on the other hand, Joshua 
would have destroyed not only the Philistines, but the whole 
earth. That Galileo hoped to get away with this kind of 
argument showed his obvious contempt for the intelligence of 
his opponents.

\textsuperscript{29}Galilei, \textit{Letter to G.D.} 213.

\textsuperscript{30}Joshua 10:12
An offer of compromise

For almost a whole year after the Letter to Castelli nothing dramatic happened. But the damage was done. Copies of the Letter to Castelli were circulating and were distorted in the process, then even more distorted by rumor. People like old Father Lorini, who, a year earlier, had not even heard the name "Ipernicus," got the impression that some new Luther had arisen, denying the miracles of the Bible and defying the authority of the Church by means of some mathematical hypothesis. When Lorini was shown a copy of the Letter to Castelli, he was profoundly shocked, and made a copy of it. On his return to his convent he discussed its contents with his fellow brethren. By now the atmosphere had become so tense, that the fathers decided the Letter to Castelli should be forwarded to the Holy Office.

On February 7, 1615, Lorini wrote to Cardinal Sfrondati:

All our Fathers of this devout conve of San Marco are of opinion that the letter contains many propositions which appear to be suspicious or presumptuous, as when it asserts that the language of the Holy Scripture does not mean what it seems to mean; that in discussions about natural phenomena the last and lowest place ought to be given to the authority of the sacred text; that its commentators have very often erred in their interpretation; that the Holy Scriptures should not be mixed up with anything except matter of religion. . . .

Ever mindful of our vow to be the 'black and white hounds' of the Holy Office. . . . when I saw that they [the 'Galileists'] expounded the Holy Scriptures according to their private lights and in a manner different from that of the common interpretation of the Fathers of the Church; that they strove to
defend an opinion which appeared to be quite contrary to the sacred text; that they spoke in slighting term of the ancient Fathers and of St. Thomas Aquinas; that they were treading underfoot the entire philosophy of Aristotle which had been of such service to Scholastic theology; and, in fine, that to show their cleverness they were airing and scattering broadcast in our steadfast Catholic city a thousand saucy and irreverent surmises; when, I say, I became aware of all this, I made up my mind to acquaint your Lordship with the state of affairs, that you in your most holy zeal for the Faith may, in conjunction with your most illustrious colleagues, provide such remedies as will appear advisable. . . . I, who hold that those who call themselves Galileists are orderly men and good Christians all, but a little overwise and conceited in their opinions, declare that I am actuated by nothing in this business but zeal for the sacred cause.31

The letter was evidently the outcome of collective decision of the Dominicans of San Marco. The letter did not mention Galileo by name, but referred only to "Galileists." Apparently, Father Lorini was not also quite definite in his mind whether the writer of the Letter to Castelli was Galileo or Copernicus.32

The Letter to Castelli was duly forwarded to the Consultor of the Holy Office for his opinion; who pronounced that, considered in the general context, Galileo’s ideas contained in the Letter to Castelli were not of a nature that they could be said to deviate from Catholic doctrine;

31Father Lorini, letter to Cardinal Sfrondati. 7 February 1615.
and, as for the remaining contents of the Letter, he had no objection. The case was dismissed but the Letters to Castelli and to the Grand Duchess remained in the files of the Inquisition, and in the minds of the theologians. The text was so carefully worded that it could not pointed out as heresy, but the intent was unmistakable; it constituted a challenge which sooner or later had to be answered. The challenge lay in the implied claim that the Copernican system belonged to the category of rigorously demonstrated physical truths to which the meaning of the Bible must be adapted; and that unless it were to be explicitly refuted and condemned, theological objections would become irrelevant and the case would go by default.

On February 16, 1615, Galileo sent a copy of his Letter to Castelli to Dini, with the request that it should be shown to Father Grienberger and, if possible, to Cardinal Bellarmine. In his covering letter there were the usual complaints about the hostility surrounding him. He remarked that the Letter to Castelli was written in haste and that he was going to improve and extend it; the extended version, as we know, became the Letter to the Grand Duchess Christina.

Before Dini answered, Ciampoli wrote, at the end of February, 1615:

Cardinal Barberini [future Pope Urban VIII], who, as you know from experience, has always admired your worth, told me only yesterday evening that with respect to these opinions he would like greater caution in not going beyond the arguments used by Ptolemy
and Copernicus, and finally in not exceeding the limitations of physics and mathematics. For to explain the Scriptures is claimed by theologians as their field, and if new things are brought in, even by an admirable mind, not everyone has the dispassionate faculty of taking them just as they are said. . . .

A few days later, on March 3, 1615, Dini’s answer arrived:

With Bellarmine I spoke at length of the things you had written. . . . And he said that as to Copernicus, there is no question of his book being prohibited; the worst that might happen, according to him, would be the addition of some material in the margins of that book to the effect that Copernicus had introduced his theory in order to save the appearances, or some such thing—just as others had introduced epicycles without thereafter believing in their existence. And with a similar precaution you may at any time deal with these matters. If things are fixed according to the Copernican system, it does not appear presently that they would have any greater obstacle in the Bible than the passage ‘[the sun] exults as a strong man to run his course,’ etc., which all expositors up to now have understood by attributing motion to the sun. And although I replied that this also could be explained as a concession to our ordinary forms of expression, I was told in answer that this was not a thing to be done in haste, just as the condemnation of any of these opinions was not to be passionately hurried. . . . I can only rejoice for you. . . .

On March 21, 1615, Ciampoli relayed further assurances that Galileo had nothing to fear so long as he kept to the province of physics and mathematics and refrained from

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34Galilei, Opere XII 159.
Ciampoli had also been told that several Jesuit astronomers were Copernicans but were still holding back, that it was essential to go on working until all quieted down, and to avoid new occasions for controversy. Dini also warned again, in the same vein: "one may write freely as long as one keeps out of the sacristy."  

Galileo answered these admonitions in a letter to Dini dated March 23, 1615. His answer was to refuse any compromise on the Copernican system. Copernicus did not mean to be understood merely as a hypothesis. The heliocentric system was to be accepted or rejected absolutely. Galileo agreed that the reinterpretation of Holy Scripture in the light of Copernicus should be left to the theologians, but that Galileo could not help it if he had been forced on theological ground, and since Bellarmine had quoted Psalm 19 to Dini, the passage that the sun "rejoiceth as a strong man to run his course," Galileo (in all humility) undertook to refute Bellarmine's interpretation of the Psalm. The "... run his course"

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35Gebler 61.


38Psalm 18:6

39Psalm 18:6
refers to the light and heat from the sun, not to the sun itself. Dini probably had the wisdom not to show this to Cardinal Bellarmine.

The next statement came from Bellarmine himself. This statement was a precise and authoritative declaration of his attitude, and in view of his position as Consultor of the Holy Office and Master of Controversial Questions, the statement amounted to an unofficial definition of the Church’s attitude to Copernicus. The statement was written in the form of a letter and clearly addressed to Galileo, whose name is expressly mentioned. The letter is dated April 4, 1615.

My Very Reverend Father,

It has been a pleasure to me to read the Italian letter and the Latin paper you sent me. I thank you for the one and the other, and I may tell you that I found them replete with skill and learning. As you ask for my opinion, I will give it as briefly as possible because, at the moment I have very little time for writing.

First, I say it seems to me that your Reverence and Signor Galileo act prudently when you content yourselves with speaking hypothetically and not absolutely, as I have always understood that Copernicus spoke. For to say that the assumption that the Earth moves and the Sun stands still saves all the celestial appearances better than do eccentrics and epicycles is to speak with excellent good sense and to run no risk whatever. Such a manner of speaking suffices for a mathematician. But to want to affirm that the Sun, in very truth, is at the center of the universe and only rotates on its axis without travelling from east to west, and

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that the Earth is situated in the third sphere and revolves very swiftly around the Sun, is a very dangerous attitude and one calculated not only to arouse all Scholastic philosophers and theologians but also to injure our holy faith by contradicting the Scriptures. . . .

Second, I say that, as you know, the Council of Trent forbids the interpretation of the Scriptures in a way contrary to the common agreement of the holy Fathers. Now if your Reverence will read, not merely the Fathers, but modern commentators on Genesis, the Psalms, Ecclesiastes, and Joshua, you will discover that all agree in interpreting them literally as teaching that the Sun is in the heavens and revolves round the Earth with immense speed and that the Earth is very distant from the heavens, as the center of the universe, and motionless. Consider, then, in your prudence, whether the Church can support that the Scriptures should be interpreted in a manner contrary to that of the holy Fathers and of all modern commentators, both Latin and Greek. . . .

Third, I say that, if there were real proof that the Sun is in the center of the universe, that the Earth is in the third sphere, and that the Sun does not go round the Earth but the Earth round the Sun, then we should have to proceed with great circumspection in explaining passages of Scripture which appear to teach the contrary, and we should rather have to say that we did not understand them than declare an opinion to be false which is proved to be true. But I do not think there is any such proof since none has been shown to me. To demonstrate that the appearances are saved by assuming the sun at the center and the earth in the heavens is not the same thing as to demonstrate that in fact the sun is in the center and the earth in the heavens. I believe that the first demonstration may exist, but I have very grave doubts about the second; and in case of doubt one may not abandon the Holy Scriptures as expounded by the holy Fathers. . . .

41Galilei, Opere XII 162-164.
Bellarmine’s letter states clearly that it is admissible not only to expound the Copernican system, but also to say that as a hypothesis it is superior to Ptolemy’s. Under the second heading Bellarmine paraphrases the legislative decision of the Council of Trent against interpreting Scripture in ways contrary to tradition. Under the third heading the condition is stated which would justify an exception to this rule being made; to wit, that the new cosmology should be really proven (or truly demonstrated). Because no proof has been shown to him, Bellarmine had "grave doubts"42 whether such proof existed; and in case of doubt the request for reinterpreting the Bible must be rejected. Bellarmine had placed the burden of proof for the Copernican system back where it belonged: on the advocates of the system. There were only two possibilities left to Galileo: either to supply the required proof, or to agree that the Copernican system should be treated, for the time being, as a working hypothesis. Bellarmine had, in a tactful way, reopened the door to this compromise in the opening sentence of his letter, where he pretended that Galileo had "contented himself with speaking hypothetically and not absolutely,"43 had praised Galileo’s prudence, and acted as if the Letters to Castelli and the Grand Duchess, which were before the Inquisition, did not exist.

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42 Galilei, Opere XII 162-164.
43 Galilei, Opere XII 162-164.
Unfortunately, Galileo was beyond listening to reason. By accepting the compromise, he would disclose to the world that he had no proof. Therefore he must reject it. It was not enough to be allowed to teach the superiority of the Copernican over the Ptolemaic hypothesis. Galileo must insist that the Church endorse it, or reject it, absolutely—even at the risk of the latter alternative, which Bellarmine's letter, Dini's and Ciampoli's warnings must have made clear to him.

But how can Galileo justify his rejection of compromise? How can he refuse to produce proof and at the same time demand that the matter should be treated as if proven? The solution of the dilemma was to pretend that he had the proof, but to refuse to produce it, on the grounds that his opponents were too dense to understand. His answer to Bellarmine was contained in a letter written in May of 1615 to Cardinal Dini:

To me, the surest and swiftest way to prove that the position of Copernicus is not contrary to Scripture would be to give a host of proofs that it is true and that the contrary cannot be maintained at all; thus, since no truths can contradict one another, this and the Bible must be perfectly harmonious. But how can I do this, and not be merely wasting my time, when those Peripatetics [Aristotelians] who must be convinced show themselves incapable of following even the simplest and easiest of arguments? . . ."44

The truly staggering thing in the passage is not its

44Galilei, Opere XII 165-167.
contemptuous arrogance, but the fact that while talking of Aristotelians, it is in fact aimed at Bellarmine; for it is on him and not on the Aristotelians, that the decision depends, and it was Bellarmine who had challenged Galileo to produce proof.

chapter 9

A crack in the wall

Early in December of 1615 Galileo arrived in Rome; the final phase of the battle had begun. This time there was no triumphant reception at the Jesuit Roman College. Father Grienberger sent word that it would be better for Galileo to bring convincing scientific proof in support of Copernicus before trying to adjust Scripture to him. The Tuscan Ambassador in Rome, Guicciardini, had warned Duke Cosimo against Galileo’s coming to Rome, and Bellarmine, who foresaw the consequences, had also advised against it.

But Galileo could not be persuaded to desist. He had maneuvered himself into a position from which he could not retreat without a loss of face. He had committed himself to an opinion, and he must be proved right; the heliocentric system had become a matter of his personal prestige. The Duke finally gave in to Galileo, and on his instructions

45Santillana 118.

Galileo took up quarters at the Villa Medici—then the Tuscan Embassy.

Galileo had repeatedly hinted that he had discovered a decisive physical proof of the Copernican theory, but had so far refused to disclose it. When he began to feel that arguing about the miracle of Joshua and the absurdness of the geocentric theory was no longer of accomplishing anything, and that his position was becoming impossible, he produced, as a last card, his so-called conclusive physical proof. This proof was his theory of the tides whose existence Galileo attributed to the composite motion of the moon and the earth around the sun.

Galileo’s theory of the tides runs as follows:47 Take a point on the earth’s surface—say Seattle. It has a two-fold motion: the daily rotation around the earth’s axis, and its annual revolution round the sun. At night when Seattle is on the opposite side of the earth from the sun, the two motions combine with each other; in daytime, when Seattle is directly opposite the sun, they work against each other. Hence Seattle moves faster at night and slower in the daytime; as a result, the water is left behind at night, and rushes ahead of the land in daytime. This causes the water to get heaped up in a high tide every twenty-four hours, always around noon. The fact that there are two daily high

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tides at Seattle instead of one, and that they wander around
the clock, Galileo would dismiss as due to several secondary
causes, such as the shape of the sea, its depth, and so forth.

The fallacy of this argument lies in the fact that
motion can only be defined relative to some fixed point of
reference. The error in Galileo's reasoning is that he
refers the motion of the water to the earth's axis, but the
motion of the land to the fixed stars.

Armed with his new weapon, Galileo now decided to make
a direct assault on the Pope with a written explanation of
Galileo's theory of the tides. The sequel is described as
follows in Ambassador Guicciardini's report to Duke Cosimo
II of Tuscany:

Galileo had relied more on his own
counsel than on that of his friends. The
Lord Cardinal del Monte and myself and also
several cardinals from the Holy Office, had
tried to persuade him to be quiet and not to
go on irritating this issue. If he wanted to
hold this Copernican opinion, he was told,
let him hold it quietly and not spend so much
effort in trying to have others share it.
Everyone fears that his coming here may be
very prejudicial and that, instead of
justifying himself and succeeding, he may end
up with an affront.

As he felt people cold toward his
intention, after having pestered and wearied
several cardinals, he threw himself on the
favor of Cardinal Orsini, and extracted to
that purpose a warm recommendation from Your
Highness. The Cardinal, then, last Wednesday
in Consistory, I do not know with what
circumspection and prudence, spoke to the
Pope on behalf of said Galileo. The Pope
told him it would be well if he persuaded him
to give up that opinion. Thereupon Orsini
replied something, urging the cause, and the Pope cut him short and told him he would refer the business to the Holy Office.

As soon as Orsini had left, His Holiness summoned Bellarmine; and, after brief discussion, they decided that the opinion was erroneous and heretical; and day before yesterday, I hear, they had a Congregation on the matter to have it declared such. Copernicus, and the other authors who wrote on this, shall be amended or corrected or prohibited; I believe that Galileo personally is not going to suffer, because he is prudent and he will feel and desire as Holy Church does.\(^{48}\)

Galileo had done everything in his power to provoke a showdown. Thus it came about that on February 23, 1616, four days after they had been summoned, the Qualifiers (i.e. theological experts) of the Holy Office met to give their opinion on the two following propositions:

(1) The sun is the center of the world and wholly immovable of local motion.
(2) The earth is not the center of the world not immovable, but moves as a whole, also with a diurnal motion.\(^{49}\)

The Qualifiers unanimously declared the first proposition to be "foolish and absurd, philosophically and formally heretical inasmuch as it expressly contradicts the doctrine of Holy Scripture in many passages the general interpretation of the Fathers and Doctors."\(^{50}\) The second proposition was declared "to deserve the like censure in

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\(^{48}\) Ambassador Guicciardini, letter to Duke Cosimo II of Tuscany, 4 March 1616.


\(^{50}\) Hull 121.
philosophy, and as regards theological truth, to be at least erroneous in faith."^{51}

**Edict of 1616**

The Qualifiers' verdict was, for the time being, overruled under pressure of the more enlightened Cardinals. Instead of it, on March 5, 1616, the General Congregation of the Index^{52} issued a more moderate decree, in which the fatal word "heresy" does not appear:

... And whereas it has also come to the knowledge of the said Congregation that the Pythagorean doctrine—which is false and altogether opposed to the Holy Scripture—of the motion of the Earth, and the immobility of the Sun, which is also taught by Nicolaus Copernicus in *De revolutionibus orbium coelestium*, and by Diego de Zuniga on Job, is being spread abroad and accepted by many—as may be seen from a certain letter of a Carmelite Father, ... wherein the said Father attempts to show that the aforesaid doctrine of the immobility of the sun in the center of the world, and of the Earth's motion, is consonant with truth and is not opposed to Holy Scripture. Therefore, in order that this opinion may not insinuate

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^{51}Hull 121.

^{52}The Index was an official list, formerly published by the authority of the Holy Office, of condemned books or writings judged by competent church authority to be contrary to faith or morals, or discreditable to the church. On June 14, 1966, the Congregation for the Doctrine of the Faith directed that the Index and the penalties of excommunication no longer had the force of law in the church. Thus, apart from exercise of prudence, the formal Index is no longer a prohibitive listing. In the modern world of extensive publishing and translating, it was an impossibility to monitor the printed matter. It is thought sufficient to have a precensorship of writings regarding the faith and morality of works prepared for members of the church. "Index of the Congregation," *The Catholic Encyclopedia*, 1976 ed.
itself any further to the prejudice of Catholic truth, the Holy Congregation has decreed that the said Nicolaus Copernicus, *De revolutionibus orbium*, and Diego de Zuniga, *On Job*, be suspended until they be corrected; but that the book of the Carmelite Father, Paolo Antonio Foscarini, be altogether prohibited and condemned, and that all other works likewise, in which the same is taught, be prohibited, as by this present decree it prohibits, condemns, and suspends them all respectively. In witness whereof the present decree has been signed and sealed with the hands and with the seal of the most eminent and Reverend Lord Cardinal of St. Cecilia, Bishop of Albano, on the fifth day of March, 1616.  

The document has consequences which are still felt today. It represents, as it were, the crack in the wall which led to the falling apart of Science and Faith. It is therefore important to examine its exact meaning and intent, as distinct from its psychological effect and its historic consequences.

In the first place; the Qualifiers talked of heresy while the decree did not. The Qualifiers' Opinion became known to the public only in 1633, when Galileo forced a second showdown, and the Opinion was quoted in the verdict of his trial. Even then, it remained a judicial opinion, without endorsement by Papal authority, and therefore not binding on members of the Church. Accordingly, the immobility of the earth never became an article of faith, nor the immobility of the sun a heresy.

53Santillana 123.
Effects of the edict of 1616

A quite different question is how the decree affected the freedom of scientific discussion. First we must note that although Galileo is the party under investigation, his name is not mentioned in the proceedings, and his works are not put on the Index.

The Letter on Sunspots was the only printed work by Galileo which contained a favorable reference to the Copernican system; but since that reference treated it merely as a hypothesis, it escaped censure.

Thus the conscious effect of the decree on scientific discussion and research was to leave things almost exactly where they had been. Galileo could discuss Copernicus and compute the course of the planets as if they were moving around the sun, provided that he spoke hypothetically. Galileo had refused to compromise, and the compromise had been enforced by decree. But what the decree unconsciously conveyed to members of the Church was that to talk of the earth's motion was contrary to faith; and what it conveyed to the scholar was that the Church had declared war on Science.

"Not to hold or defend. . . ."

Six days after the decree, Galileo was received by the Pope, in an audience which lasted for forty-five minutes. While everything was done to spare Galileo public
humiliation, he had been confidentially but firmly directed to keep with in the prescribed limits. This had occurred between the session of the Qualifiers on February 23, 1616, and the publication of the decree. On Friday, February 26, 1616, there is the following entry in the Inquisition file:

"Friday, 26 February 1616. The Lord Cardinal Mellini notified the Reverend Fathers, the Assessor, and the Commissary of the Holy Office that the censure passed by the theologians upon the propositions of Galileo--to the effect that the Sun is the center of the world and immovable from its place, and that the Earth moves, and also with a diurnal motion--had been reported; and His Holiness had directed the Lord Cardinal Bellarmine to summon before him the said Galileo and admonish him to abandon the said opinion; and, in case of his refusal to obey, that the Commissary is to enjoin him, before a notary and witness, a command to abstain altogether from teaching or defending this opinion and doctrine and even from discussing it; and, if he do not acquiesce therein, that he is to be imprisoned."54

One of the principal points of controversy about the trial of Galileo in 1633 hinges on the question whether the procedure envisaged "in case of his refusal to obey,"55 took place or not. If it did, Galileo was bound by an unconditional and absolute injunction not only not to defend, but not even to discuss Copernicus. If it did not take place, the obligation placed on him could be interpreted loosely.

There exist three documents bearing on this point, and

54Hull 31.

55Hull 31.
they contradict each other. One was found among the *Decreta* of the Congregation. It is the minutes of a meeting on March 3, 1616, of which the relevant passage reads:

The Lord Cardinal Bellarmine having reported that Galileo Galilei, mathematician, had in terms of the order of the Holy Congregation been admonished to abandon the opinion he had hitherto held, that the Sun is the center of the spheres and immovable and that the Earth moves, and had acquiesced therein. . . .

This seems to indicate that the absolute injunction foreseen "in case of his refusal to obey" was not served. The second document seems to point to the same conclusion. To counter rumors that he had been humiliated and punished, Galileo asked Bellarmine for a certificate on the proceedings that had taken place, and Bellarmine wrote as follows:

We, Roberto Cardinal Bellarmine, having heard that it is calumniously reported that Signor Galileo Galilei has in our hand abjured and has also been punished with salutary penance, and being requested to state the truth as to this, declare that the said Galileo has not abjured, either in our hand, or the hand of any other person here in Rome, or anywhere else, so far as we know, any opinion or doctrine held by him; neither has any salutary penance been imposed on him; but that only the declaration made by the Holy Father and published by the Sacred Congregation of the Index has been notified to him, wherein it is set forth that the doctrine attributed to Copernicus, that the Earth moves around the Sun, and that the Sun is stationary in the center of the world and

56Hull 32.

57Hull 32.
HOLMES 52

does not move from east to west, is contrary to the Holy Scriptures and therefore cannot be defended or held. In witness whereof we have written and subscribed these present with our hand this twenty-sixth day of May, 1616. 58

There is no mention here of a formal injunction, and the operative words are that the Copernican doctrine cannot be "defended or held." 59 There is no prohibition against discussing it.

The third document is a minute in the Vatican files which seems to contradict the previous two by alleging that Galileo was formally forbidden "to hold, teach, or defend in any way whatsoever, verbally or in writing" 60 the Copernican doctrine. This minute, of doubtful reliability, 61 has given rise to one of the most embittered controversies in the history of science, which has now been raging for nearly a century. It may be thought that to attribute such importance to the difference between an absolute injunction and an admonition is splitting hairs. But there is, in fact, a world of difference between the admonition not to

58 Hull 34.
59 Hull 31.
60 Hull 31.

61 The fact that this minute would have proved very useful in the hands of Galileo's opponents, yet was never mentioned by them, leads historians to conclude that this minute did not exist in the files of the Inquisition but was added at a later time. Also, the authenticity of the two previous minutes, added to the contradictory nature of the third minute, leads one to think that the third minute was a forgery.
"hold or defend"\textsuperscript{62} a doctrine, and the command not to teach or to discuss it "in any way whatsoever."\textsuperscript{63} In the first case, it could be discussed as before, in terms of a mathematical hypothesis; in the second case, it could not be discussed at all.

Bellarmine's certificate and the Minute of March 3, 1616, seem to indicate that Galileo was under no absolute prohibition. Nevertheless, during the next few years he had to proceed more cautiously than before.

The next two years Galileo was mostly ill, but did some minor work, such as the construction of a naval telescope, and also made an attempt, which failed, to use the periods of the Jupiter moons as an aid to determine geographical longitude. It was apparently the last time he took a positive interest in astronomical research.

After two years, in 1618, he could hold back no longer, and sent his treatise on the tides to Archbishop Leopold of Austria. Galileo hoped, no doubt, that the treatise would be printed in Austria without formal authorization on his part, but it came to nothing.

In the same year three comets appeared in the sky. They announced the beginnings of the Thirty Years War, and of the most disastrous of the many controversies in which Galileo became involved.

\textsuperscript{62}Hull 31.

\textsuperscript{63}Hull 31.
Final controversy: The Assayer

The final controversy was caused by a lecture, subsequently published, by the Jesuit Father Horatio Grassi of the Jesuit Roman College. The lecture expressed the correct view that comets move in regular orbits like planets, at a distance far greater than the moon's. In support of this view, Grassi quoted with approval Tycho's conclusions regarding the famous comet of 1577. The treatise was a further step in the Jesuits' retreat from Aristotle, and a further sign of the Order's implicit endorsement of the Tychonic system.

When Galileo read the treatise, he had an outburst of fury. Galileo's outburst was due to the fact that the treatise did not mention Galileo's name—whose only contribution to the theory of comets had been a casual endorsement of Tycho's views in the Letters on Sunspots.64

But now the situation had changed. The Tychonic compromise must be rejected, so that the choice should remain confined between the discredited Aristotle and Copernicus. Galileo abruptly reversed his own arguments: he decided that comets are not real objects at all, but optical illusions like the aurora borealis, caused by the reflection of earthly vapors, which reach up into the sky past the

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moon. If they were real, they ought to appear larger as they approach the earth and smaller as they recede, whereas, according to Galileo, comets appear at their full size and then vanish altogether.

Apart from wishing to prove Tycho and Grassi understood nothing of astronomy, Galileo had another motive for denying that comets exist: their paths were so markedly elliptic that they could not be reconciled with the circular orbits in which Galileo believed all real heavenly objects must move around the sun.

Galileo did not attack Grassi directly, under his own name, but let his former pupil Mario Guiducci, sign a Discourse on Comets. The surviving manuscript bearing Guiducci’s name, however, is in Galileo’s handwriting. At the end of the treatise, Grassi is reproached for failing to mention Galileo’s discoveries, and Father Scheiner for “trying to represent himself as the original discoverer of the discoveries of others. ..”65

Grassi replied with a personal attack on Galileo. Grassi showed that Galileo claimed priority for discoveries which were not his own, and took up the challenge about the Tychonic system: since Aristotle was refuted and Tycho rejected by Galileo, did Galileo mean that Grassi should have endorsed Copernicus, condemned and abhorred by every good Catholic?

65 Galilei, Saggiatore 232.
Grassi's pamphlet was published in 1619 under the title *The Astronomical and Philosophical Balance*. Galileo's answer was the famous *Il Saggiatore*—(*The Assayer*), who measures things on the finer balance designed for precious metals. Galileo took two years to write *The Assayer*, and it was published in 1623—four years after Grassi's counter-attack.

*The Assayer* was written in the form of a letter to a friend. It starts with a tirade against all who tried to rob Galileo "of that glory which was mine." Galileo also explains the reason which forced him to break his previous resolve to publish no more: Galileo's enemies, having unsuccessfully tried to steal his discoveries, now try to attribute to him "the works of others"—namely, Guiducci's tract. Galileo indignantly denies having had any part in that tract beyond discussing the subject with Guiducci; but now he has to break his silence "to discourage those who refuse to let sleeping dogs lie, and who stir up trouble with men that are at peace."

The major part of the work consists of sarcastic refutations of everything Grassi has said, regardless whether the man had blundered—which he often had—or hit on the truth.

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Alienation of the Jesuit Order

Grassi was a prominent Jesuit scholar, not at all the fool that Galileo made him out to be. The treatment meted out to him, added to the equally unprovoked attacks upon Father Scheiner, turned these two influential members of the Jesuit Order into unrelenting enemies of Galileo. A third Jesuit whom Galileo had attacked without necessity (on a question of military engineering, of all things) was Father Firenzuola. Twenty-five years later, Firenzuola was the Inquisition's Commissary General at Galileo's trial. The result of all this was that the Jesuits as a body turned against Galileo. Father Grienberger, who succeeded Clavius as head of the Jesuit Roman College, was to remark later that "if Galileo had not incurred the displeasure of the Company [of Jesus], he could have gone on writing freely about the motion of the earth to the end of his days."69

The clash with the Aristotelians was inevitable. The clash with the Jesuits was not. This is not an excuse for the vindictiveness with which Grassi and Scheiner reacted when provoked, nor for the manner in which the Jesuit Order turned its back on Galileo. The point to be established is that the attitude of the Jesuit Roman College and of the Jesuits in general changed from friendliness to hostility, not because of the Copernican views held by Galileo, but because of his personal attacks on leading authorities of

69 Santillana 233.
chapter 11

Pernicious adulation

While he was writing The Assayer, Galileo's loyal supporter, Cosimo II, died and the Dowager Christina became Regent. Bellarmine, who had been a restraining influence at the head of the Jesuit Order, died in the same year. But against these losses, Maffeo Barberini (Pope Urban VIII) was elected to the papacy in 1623--just in time for Galileo to dedicate The Assayer to him.

Back in 1616, Barberini had opposed the decree of the Congregation and intervened in favor of Galileo, a fact of which he often boasted later. In 1620 he had written an ode in honor of Galileo, with the title Adulatio Perniciosa--which can be translated as "Pernicious Adulation." Barberini even went so far as to pay homage to Copernicus--and added the remark that "the Church neither had condemned, nor ever would condemn his doctrine as heretical, but only as reckless."70

Renuncini, a brother of Cardinal Dini, wrote to Galileo:

I swear to you that nothing pleased his Holiness so much as the mention of your name. After I had been speaking of you for some time, I told him that you, esteemed Sir, had an ardent desire to come and kiss his toe, if

70 Santillana 162.
his Holiness would permit it, to which the Pope replied that it would give him great pleasure, if it were not inconvenient to you.  

Galileo was ill, so he could journey to Rome only in the spring of the next year. He had six long audiences with Urban in the course of six weeks.

What exactly was said during those six audiences, has been another matter of conjecture and controversy. Only a few points have been established with certainty: first, that in spite of Galileo’s attempt at persuasion, Pope Urban VIII refused to revoke the decree of 1616; second, that Galileo’s impression derived from the six long audiences was that he could write pretty well anything he pleased in support of Copernicus as long as he avoided theological arguments and stuck to speaking hypothetically. Third, Urban himself made a suggestion how to get around the difficulty of arguing in favor of the Copernican system without asserting it to be true. The suggestion was this: assuming that a hypothesis explains satisfactorily certain phenomena, this does not necessarily mean that it is true, for God is all-powerful and may have produced the said phenomena by some entirely different means which are not understood by the human mind.

Thus encouraged, Galileo, who was now past sixty, felt the road at last free to embark on his great defense of Copernicus, which, as stated previously, he intended to call

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71Gebler 115.
Dialogue in the Flux and Reflux of the Tides. It took him four years to write it, but once again he could not retreat. In January, 1630, the Dialogue of the Great World Systems was completed.

chapter 12

Dialogue of the Great World Systems

The Dialogue of the Great World Systems is carried on by three characters. Salviati, who is Galileo’s mouthpiece; Sagredo, who plays second fiddle to him under the guise of neutrality, and Simplicio, the defender of Aristotle and Ptolemy. Salviati and Sagredo had been friends of Galileo, and were now both dead; Simplicio, Galileo claimed, derived his name from Simplicius, the sixth century commentator on Aristotle, but the double meaning is evident. It is Simplicio who, after being shown up over and over again, trots out at the very end Pope Urban’s argument (concerning the compatibility of Copernicanism with Scripture) as coming "from a most eminent and learned person, and before whom one must fall silent:"72 whereupon the other two declare themselves silenced by "this admirable and angelic doctrine,"73 and decide "to go and enjoy an hour of refreshment in the gondola that awaits us."74 And thus the

72Galilei, Dialogue.
73Galilei, Dialogue.
74Galilei, Dialogue.
Dialogue of the Great World Systems ends with what can only
be described as a condescending remark directed at the Pope-
-with consequences that one may expect.

Another surprising thing about the Dialogue of the
Great World Systems is that Galileo not only misrepresented
the Copernican system as a beautifully simple affair, but
seems to have been himself unaware of its complexities. He
had never taken much interest in the tiresome details of
planetary theory, and there was no real reason for him to
plod through the technical chapters in the Revolutions from
cover to cover. If he had done so, he could not have
believed that all planets move with the same linear
velocity, nor attributed the idea to Copernicus that the
moon either shines in her own light or is transparent to the
light of the sun.75 About the difficulties of the
Copernican system we learn only by an aside:

... how each planet governs itself in
its particular revolutions, and how precisely
the structure of its circle is framed, which
is what is commonly called the Theory of the
Planets, we cannot undoubtedly resolve.
Mars, that has so much puzzled our modern
astronomers, is a proof of this.76

This was written some twenty years after Kepler’s
determination of the Martian orbit laid a new foundation for
planetary theory. The truth is that after his sensational
discoveries in 1610, Galileo neglected both observational

75Galilei, Dialogue 342.
76Galilei, Dialogue 462.
research and astronomic theory in favor of his propaganda crusade. By the time Galileo wrote the *Dialogue of the Great World Systems*, he had lost touch with new developments in that field, and forgotten even what Copernicus had said.

The manuscript was completed in January of 1630. Galileo intended to supervise the printing of the book in Rome, but could not go at once. His friends assured him that there would be no difficulty. Father Castelli, who now lived in Rome, wrote that Pope Urban VIII had assured that "if it had depended on him, the prohibition of 1616 would never have been passed."\(^7\)

Galileo arrived in Rome at the beginning of May, 1630, and was received in a long audience by Urban VIII. The Pope again confirmed that there was no objection against discussing the merits of the Copernican system, provided that it was treated strictly as a hypothesis. He objected, however, to the intended title, *Dialogue on the Flux and Reflux of the Tides*, which laid too much emphasis on physical proof, and suggested that it should be called a *Dialogue on the Great World Systems* instead. He was, of course, far too busy to read the book himself, and left this task to the censors.

The function of the Chief Censor and Licenser was exercised by Father Niccolo Riccardi. He was another Florentine, and accordingly devoted to Galileo, though he

\(^7\)Santillana 183.
believed that the Ptolemaic and Copernican systems were mere scientific fancies since the ultimate truth was that the stars were moved by angels. But this did not prevent him from admiring the ingenuity of men like Galileo who were plotting the courses of these angelic gymnastics.

Father Riccardi read through the manuscript of the Dialogue of Great World Systems, and came to the conclusion that it was far above his head. He knew that the Pope had approved of the idea of the book and had encouraged Galileo to go ahead. But he also sensed, though unable to follow the argument in detail, that the book contradicted the decree of 1616. To escape the dilemma he instructed his assistant, Father Visconti, to work through the text and to make suitable alterations.

Father Visconti was equally unfit for the task. He made some minor corrections which aimed at making the pro-Copernican arguments appear more hypothetical, and then handed the text back to his superior. Father Riccardi felt even more helpless than before. He played for time, and finally decided that he must shoulder his responsibilities and revise the text himself. But now he met with the concerted pressure of Galileo and his allies; one of which was the Papal Secretary Ciampoli, who indirectly represented the will of the Pope. The result of this pressure was that Father Riccardi agreed to make an unusual deal: to save time, he granted the permission to print the book in
advance, on condition that he would revise it himself, and then pass on each revised sheet to the printer. He was to be assisted in his task by the universally respected President of the Linceian Academy, Prince Cesi.

As soon as this agreement was concluded, Galileo returned to Florence to escape the heat of Rome, on the understanding that he would be back in the autumn. But soon after his departure, Prince Cesi died. A few weeks later, another episode of the plague broke out, and the strict quarantine made communications between Rome and Florence difficult. This provided a welcome opportunity for Galileo to escape the conditions under which the permission to print had been granted: he demanded that the book be printed in Florence out of Riccardi's control.

Father Riccardi at first flatly refused to grant permission for printing the book in Florence without revising it; he demanded that Galileo should send the manuscript to Rome for this purpose. Galileo answered that quarantine regulations made the safe dispatch of the manuscript impossible, and insisted that the final revision should be done by a Florentine censor. He enlisted the support of the Grand Duke (to whom Riccardi, as a Florentine, owed allegiance). The Tuscan Ambassador, Niccolini, and the Papal Secretary, Ciampoli, also renewed the pressure. Finally, Father Riccardi agreed that the work should be revised and printed in Florence, except for the
preface and concluding paragraphs which must be submitted to himself.

The revision was supposed to be done by the Florentine Inquisitor, Father Clemente Egidii. But this was not to Galileo's taste, who proposed Father Stefani instead of Egidii. Riccardi again agreed. Evidently Father Stefani was entirely under Galileo's influence, for he made very few corrections and the printing began early in 1631. And thus, in February of 1632, the first printed copies of the Dialogue of the Great World Systems came from the press.

Reaction from the church

It only took a few weeks for the Pope and the Holy Office to discover that they had been outwitted. By August of 1632, the book was confiscated, and in October Galileo was summoned to appear before the Inquisition in Rome. He succeeded in delaying his journey on grounds of ill health and other pretenses for four months; but in February of 1633, he had to go. He took up quarters at the Tuscan Embassy, as before; but for another three months nothing happened. Finally, on April 12, 1633, Galileo's first interrogation at the Holy Office took place.

There is little doubt that the decision to instigate proceedings was Pope Urban VIII's, who thought that Galileo had played him like a fool. There is equally little doubt that the Jesuits used their influence to have the book
banned and to turn the Pope against its author. But it did not require much Jesuit cunning to turn Urban’s respect into the fury of the betrayed friend. Not only had Galileo gone, in letter and spirit, against the agreement to treat Copernicus’ theory strictly as a hypothesis, not only had he obtained the permission to print by strong-arm tactics, but Urban’s argument was only mentioned briefly at the very end of the book, and put into the mouth of the simpleton who on any other point was invariably proved wrong. The Pope even suspected that Simplicius was intended as a caricature of himself. This was untrue; but Urban’s suspicion—justified or not—persisted long after his fury had abated:

I hear from Rome, [Galileo wrote three years after his trial] that his Eminence Cardinal Antonio Barberini and the French Ambassador have seen his Holiness and tried to convince him that I never had the least idea of perpetrating so sacrilegious an act as to make game of his Holiness, as my malicious foes have persuaded him, and which was the primary cause of all my troubles.\(^78\)

If corroboration were needed, it is to be found in Niccolini’s reports. They stress that Urban “was so incensed that he treated this affair as a personal one,”\(^79\) and quote Urban’s belief that Galileo had deceived him.

\(^78\)Gebler 161.

\(^79\)Gebler 183.
chapter 13

**Trial of Galileo**

The proceedings against Galileo began with the appointment of a special commission to investigate the whole affair. The Commission's findings were that Galileo had transgressed orders in deviating from the hypothetical treatment of Copernicus and by maintaining absolutely the earth's motion; that he had erroneously ascribed the phenomena of the tides to it; and that he had been deceitfully silent about the command laid upon him by the Holy Office in 1616 "to relinquish altogether the said opinion. . . nor henceforth to hold, teach or defend it in any way whatsoever, verbally or in writing." 80

The Commission did not recommend any specific steps to be taken against Galileo; as for his book, the contents were charged with disobeying the decree of 1616 on eight counts, but the Commission suggested that all these matters could be corrected if the book were thought to be of value. The report was then handed over for further action to the Inquisition, which issued its summons in October 1632 and first interrogated Galileo on April 12 of the following year (1633).

According to the basic rule of inquisitional procedure, the charges were not communicated to the accused; Galileo

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was, on the contrary, asked whether he knew or guessed on what grounds he had been summoned. Galileo said that he believed it was on account of his latest book. The Commissary, Firenzuola, then questioned him in detail about the events of 1616. Galileo stated that he had been told by the Lord Cardinal Bellarmine that he could not treat the Copernican theory as established truth—only as a hypothesis. Galileo continued by holding to the fact that he had not disobeyed this order. The Inquisitor then read to him the alleged absolute injunction of 1616 that Galileo must "neither hold, defend, nor teach that opinion in any way whatsoever." Galileo did not directly deny the absolute injunction, but said that he could not remember the words "not to teach" and "in any way;" he referred to Bellarmine's certificate which did not contain these words. The Inquisitor then went over the whole story of the negotiations concerning the imprimitur (papal permission to print). The Inquisitor asked whether when Galileo applied for permission to print the Dialogue of the Great World Systems, Galileo had informed Father Riccardi about the command of 1616 that had been issued to him. Galileo answered that he did not think it necessary to do so, "... for I have neither maintained nor defended in that book the

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81 Fahie 163.
82 Fahie 163.
83 Fahie 163.
opinion that earth moves and that the sun is stationary, but have rather demonstrated the opposite of the Copernican opinion, and shown that the arguments of Copernicus are weak and not conclusive."

Five days after the hearing, three members of the Inquisition, who had been appointed to examine the contents of the book, handed in their reports. By a long list of quotations they proved beyond doubt that Galileo had not only discussed the Copernican view as a hypothesis, but that he had taught, defended and held it, and that he had even gone so far as to mock and deride those who did not share his view.

To pretend, with the evidence of the printed pages of his *Dialogue of the Great World Systems* staring him in the face, that the book said the opposite of what it did, was suicidal. The pretense that the *Dialogue of the Great World Systems* was written in refutation of Copernicus was so obviously dishonest that Galileo's case would have been lost in any normal court of law.

The next, unexpected turn of events is best described in the words of one of the principal personalities in the drama, the Commissary of the Inquisition, Firenzuola. In a letter to Urban's brother, Cardinal Francesco Barberini, who was one of the judges at the trial, Firenzuola reported:

... More especially as Galileo has

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84Santillana 241.
in his examination denied what is plainly evident from the book written by him. . . . Finally, I suggested a course, namely, that the Holy Congregation should grant me permission to treat extra-judicially with Galileo, in order to render him sensible of his error and bring him, if he recognizes it, to a confession of the same. . . . That no time might be lost, I entered into discourse with Galileo yesterday afternoon, and after many and many arguments and rejoinders had passed between us, by God's grace, I attained my object, for I brought him to a full sense of his error, so that he clearly recognized that he had erred and had gone too far in his book. . . . He requested, however, a little time in order to consider the form in which he might most fittingly make the confession, which, as far as its substance is concerned, will, I hope, follow in the manner indicated. . . . I trust that His Holiness and your Eminence will be satisfied that in this way the affair is being brought to such a point that it may soon be settled without difficulty. The court will maintain its reputation; it will be possible to deal leniently with the culprit. . . .

[Rom, April 28, 1633]

Two days after the interview on April 30, Galileo was called for examination a second time, and was asked whether he had anything to say. He made the following statement:

Being, by the kind permission of the authorities, at liberty to send about my servant, I succeeded in procuring a copy of my book, and having procured it, I applied myself with the utmost diligence to its perusal and to a most minute consideration thereof. And, as owing to my not having seen it for so long, it presented itself to me, as it were, like a new writing and by another author, I freely confess that in several places it seemed to me set forth in such a form that a reader ignorant of my real purpose might have had reason to suppose that

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85Firenzuela, letter to Cardinal Francesco Barberini, 28 April 1633.
the arguments brought on the false side, and which was my intention to confute, were so expressed as to be calculated rather to compel conviction by their cogency than to be easy of solution. . . My error, then, has been--and I confess it--one of vainglorious ambition and of pure ignorance and inadvertence.86

When he had finished this statement, the hearing was closed.

Galileo was called again ten days later, on May 10, 1633, to a purely formal hearing, at which he handed in his written defense. In the first part Galileo argued that he was unaware of a specific and absolute injunction in 1616, and made out a convincing case for this. The main point of his defense was that:

. . . . those faults which are seen scattered throughout my book, have not been artfully introduced with any concealed or other than sincere intention, but have only inadvertently fallen from my pen, owing to a vainglorious ambition and complacency in desiring to appear more subtle than the generality of popular writers, as indeed in another deposition I have confessed; which fault I shall be ready to correct with all possible industry whenever I may be commanded or permitted by Their Most Eminent Lordships.87

The remainder of the trial was now expected to be mere formality. Throughout the proceedings Galileo had been treated with great consideration and courtesy. Against all precedent he was not confined to the dungeons of the Inquisition, but was allowed to stay as the Tuscan 85Santillana 255.

87Fahie 301-302.
Ambassador's guest at the Villa Medici until after his first examination. Then Galileo had to surrender formally to the Inquisition, but instead of being put in a cell, he was assigned a five-room flat in the Holy Office itself, overlooking St. Peter's and the Vatican gardens, with his own personal valet and a chef to look after his food and wine. Here Galileo stayed from April 12, 1633, to the third examination on May 10, 1633. Then, before his trial was concluded, Galileo was allowed to return to the Tuscan Embassy—a procedure quite unheard of in the history of the Inquisition.

Three days later Galileo was called for his third and final examination. After he had taken the oath, he was questioned about his real convictions concerning the two cosmological systems. Galileo answered that before the decree of 1616 he had considered that either Ptolemy or Copernicus might be true in nature, "but after the said decision, assured of the wisdom of the authorities, I ceased to have any doubt; and I held, as I still hold, as most true and indisputable the opinion of Ptolemy, that is to say, the stability of the Earth."88

Galileo was then told that the Dialogue of the Great World Systems appeared to defend and extol the Copernican system, and the fact alone that he had written the said book, led the Inquisition to believe that he had held the

88Santillana 302.
Copernican opinion. Once again Galileo was asked to state the truth freely. He answered that he had written the book to set forth the arguments for both sides, and repeated again "I do not now hold the condemned opinion, and have not held it since the decision of the authorities [in 1616]." 89

Galileo was admonished a third time that judging from the contents of his book he was presumed to support the theories of Copernicus, or at least to have done so at the time he wrote it. Galileo answered: "I do not hold, and have not held, this opinion on Copernicus since the command was intimated to me that I must abandon it..." 90. When he was for a last time bidden to speak the truth, under the superficial threat of torture, Galileo repeated, "I am here to obey and I have not held this opinion since the decision was pronounced, as I have stated." 91

If it had been the Inquisition's intention to break Galileo, this obviously was the moment to confront him with the excerpts from his book--which were in the files in front of the judges--and to convict him of perjury. Instead, immediately following Galileo's last answer, the minutes of the trial say: "And as nothing further could be done in execution of the decree, his signature was obtained to his

89 Santillana 303.
90 Fahie 310.
91 Fahie 310.
deposition and he was sent back.\(^{92}\)

**chapter 14**

**Judgement of Galileo**

Both the judges and the defendant knew that Galileo was lying; both the judges and Galileo knew that the threat of torture was merely a ritual formula, which could not be carried out; and that the hearing was a pure formality. Galileo was led back to his five-room apartment, and on the next day the sentence was read out to him.\(^{93}\) The *Dialogue of the Great World Systems* was prohibited; Galileo was to renounce the Copernican opinion, was sentenced to prison, and for three years to come, was to repeat once a week the seven penitential psalms. He was then presented with the formula of the abjuration,\(^{94}\) which he read out. And that was the end of it.

The prison took the form of a stay at the Grand Duke’s villa at Trinita del Monte, followed by a stay in the palace of Archbishop Piccolomini in Siena. Finally Galileo returned to his farm at Arcetri, and later to his house in Florence, where he spent the remaining years of his life. The recital of the penitential psalms was delegated, with ecclesiastical consent, to his daughter, Sister Marie

\(^{92}\)Fahie 311.

\(^{93}\)For Galileo’s sentence see Appendix 1

\(^{94}\)For the formula of abjuration see Appendix 2
Celeste, a Carmelite nun.  

From the purely legal point of view the sentence was certainly a miscarriage of justice. If one worked through the maze of words, it appears that he was found guilty on two counts: firstly, of having ignored both Bellarmine's admonition, and the alleged formal injunction of 1616, and having deceitfully received the license to print by not notifying the censor of the decree of 1616, and secondly, of having rendered himself suspect of heresy by holding to the Copernican doctrine which was considered contrary to Scripture. The sun-centered universe, however, had never been officially declared a heresy, since neither the opinion of the Qualifiers, nor the decree of the Congregation of 1616, had been confirmed by the Ecumenic Council. Had not Pope Urban VIII himself said that the Copernican opinion was not heretical but merely reckless? 

On the other hand, the judgement hushes up the incriminating contents of the book by stating that Galileo had represented the Copernican system as merely probable—which is a large understatement. The judgement also hushes up the fact that Galileo had been lying and perjuring himself before his judges by pretending that he had written the book in refutation of Copernicus, that he had "neither

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95During his Padua days, Galileo had lived with a Venetian woman, Marina Gamba, who bore him two daughters and a son. He parted from her when he moved to the Court of Medicis in Florence.

96Fahie 214.
maintained nor defended the opinion that the earth moves, "97 and so forth. The gist of the matter is that the intention was, clearly, to treat the famous scholar with consideration and leniency, but at the same time to hurt his pride, to prove that even a person of Galileo's stature was not allowed to mock the Jesuits, the Dominicans, the Pope, and the Holy Office without repercussions.

The only real penalty inflicted on Galileo was that he had to publicly recant his conviction. On the other hand, up to the age of fifty Galileo had been hiding that conviction, and at his trial he had twice offered to add a chapter to the Dialogue of the Great World Systems refuting Copernicus. To recant in the Basilica of the Convent of Minerva, when everybody understood that this was an enforced ceremony, was certainly much less dishonorable for a scholar than to publish a scientific work contrary to his convictions.

chapter 15

Last years

Galileo spent the year following the trial in writing the book on which his fame rests: the Dialogues Concerning Two New Sciences. At long last, in his seventies, he rediscovered his real vocation: the science of dynamics. He had abandoned it a quarter of a century before, when he embarked on his propaganda crusade for the heliocentric

97Fahie 295.
astronomy of which he had only a sketchy knowledge. The crusade had ended in disaster, and out of the shambles modern physics was born.

Galileo died at the age of seventy-eight, in 1642, the year Isaac Newton was born, surrounded by friends and pupils.

chapter 16

conclusion

In the fall of 1992, the Vatican proclaimed that the Roman Catholic Church erred in condemning Galileo for arguing against the accepted view of the Earth as the center of the universe. The Vatican noted that the verdict of the 1633 trial became a symbol of the church’s supposed rejection of scientific progress.

What implications does this admission have for the church today? How can Galileo serve as a current model for understanding the scientific and biblical views of nature?

First we need to put the record straight. Galileo’s primary enemies who engineered his downfall were the Aristotelian natural philosophers (scientists) in the academic establishment. Beginning with his student years in 1581 at the University of Pisa, he continually challenged his professors. On point after point, he demonstrated how their inherited science was in error.
Galileo promoted an entirely new way of doing science based on experiment and mathematical analysis. He was not content to argue in Latin in the faculty lounge, but attacked the professors in lectures and pamphlets. Galileo's major lifelong battle was to free the new science from the authority of philosophy.

After 20 years of defeat on academic turf, Galileo's bitter enemies formed a league to muzzle him on theological grounds. Galileo then showed himself a competent theologian in his presentation to the Holy Office. He made two major points: astronomical theories could not be matters of faith, and the new cosmology was in harmony with the Bible, which speaks in the ordinary language of the people. Galileo held that while the Bible may tell how one goes to Heaven, it doesn't tell how the Heavens go.

Nevertheless, at Galileo's trial in 1633 the Inquisition found the mobility of the earth contrary to Scripture. Galileo was forced to recant. He spent the last nine years of his life under house arrest near Florence, where he continued his scientific writing. Galileo remained loyal to his church even though it had turned its back on him. He recognized that his suffering was due primarily to the Aristotelian scientists.

Science lessons

Galileo's life can teach us several important lessons.
First, contrary to a long-standing mythology, his science and theology were not enemies but partners—two "books of God." "God is known by Nature in his works, and by doctrine is his revealed word." The Book of Nature is written in the "language of mathematics;" the Book of Scripture is in everyday language of the people primarily for "the salvation of souls and the service of God."

Second, attempts today by some scholars to make modern science support their New Age or naturalistic philosophy reverses Galileo's "scientific revolution." It is a blatant misuse of science.

Third, current attempts by some theologians to derive or evaluate science from the Bible is equally misguided. It repeats the 1633 error that has given Christianity an antiscience stigma.

Many recent scientific discoveries and their possible applications affect man more directly than ever before, to the point of seeming to threaten the very basis of what is the human. As Christians we must resist the temptation to make the Bible DO science. Then we can seek its guidance on how to USE science and technology for the glory of God and the good of his creation.
SELECTED BIBLIOGRAPHY


Hull, Ernest. *Galileo and His Condemnation*.


APPENDIX 1

"Whereas you, Galileo, son of the late Vincento Galilei, Florentine, aged seventy years, were in the year 1615 denounced to this Holy Office for holding as true the false doctrine taught by some that the Sun is the center of the world and immovable and that the Earth moves, and also with a diurnal motion; for having disciples to whom you taught the same doctrine; for holding correspondence with certain mathematicians of Germany concerning the same; for having printed certain letters, entitled "On the Sunspots", wherein you developed the same doctrine as true; and for replying to the objections from the Holy Scriptures, which from time to time were urged against it, by glossing the said Scriptures according to your own meaning: and whereas there was thereupon produced the copy of a document in the form of a letter, purporting to be written by you to one formerly your disciple, and in this divers propositions are set forth, following the position of Copernicus, which are contrary to the true sense and authority of Holy Scripture:

This Holy Tribunal being therefore of intention to proceed against the disorder and mischief thence resulting, which went on increasing to the prejudice of the Holy Faith, by command of His Holiness and of the Most Eminent Lords Cardinals of this supreme and universal Inquisition, the two propositions of the stability of the Sun and the motion of the Earth were by the theological Qualifiers qualified as follows:

The proposition that the Sun is the center of the world and does not move from its place is absurd and false philosophically and formally heretical, because it is expressly contrary to the Holy Scripture.

The proposition that the Earth is not the center of the world and immovable but that it moves, and also with a diurnal motion, is equally absurd and false philosophically and theologically considered at least erroneous in faith.

But whereas it was desired at that time to deal leniently with you, it was decreed at the Holy Congregation held before His Holiness on the twenty-fifth of February, 1616, that his Eminence the Lord Cardinal Bellarmine should order you to abandon altogether the said false doctrine and, in the event of your refusal, that an injunction should be imposed upon you by the Commissary of the Holy Office to give up the said doctrine and not to teach it to others, not to defend it, nor even discuss it; and failing your acquiescence in this injunction, that you should be imprisoned. And in the execution of this decree, on the following day, at the Palace, and in the presence of his Eminence, the said Lord Cardinal Bellarmine, after being gently admonished by the said Lord Cardinal, the command was enjoined upon you by the Father Commissary of the Holy Office of that time, before a notary and witnesses, that you...
were altogether to abandon the said false opinion and not in future to hold or defend or teach it in any way whatsoever, neither verbally nor in writing; and, upon your promising to obey, you were dismissed.

And, in order that a doctrine so pernicious might be wholly rooted out and not insinuate itself further to the grave prejudice of Catholic truth, a decree was issued by the Holy Congregation of the Index prohibiting the books which treat of this doctrine and declaring the doctrine itself to be false and wholly contrary to the sacred and divine Scripture.

And whereas a book appeared here recently, printed last year at Florence, the title of which shows that you were the author, this title being: 'Dialogue of Galileo Galilei on the Great World Systems'; and whereas the Holy Congregation was afterward informed that through the publication of the said book the false opinion of the motion of the Earth and the stability of the Sun was daily gaining ground, the said book was taken into careful consideration, and in it there was discovered a patent violation of the aforesaid injunction that had been imposed upon you, for in this book you have defended the said opinion previously condemned and to your face declared to be so, although in the said book you strive by various devices to produce the impression that you leave it undecided, and in express terms as probable: which, however, is a most grievous error, as an opinion can in no wise be probable which has been declared and defined to be contrary to divine Scripture.

Therefore by our order you were cited before this Holy Office, where, being examined upon your oath, you acknowledged the book to be written and published by you. You confessed that you began to write the said book about ten or twelve years ago, after the command had been imposed upon you as above; that you requested license to print it without, however, intimating to those who granted you this license that you had been commanded not to hold, defend, or teach the doctrine in question in any way whatever. You likewise confessed that the writing of the said book is in many places drawn up in such a form that the reader might fancy that the arguments brought forward on the false side are calculated by their cogency to compel conviction rather than to be easy of refutation, excusing yourself for having fallen into an error, as you alleged, so foreign to your intention, by the fact that you had written dialogue and by the natural complacency that every man feels in regard to his own subtleties and in showing himself more clever than the generality of men in devising, even on behalf of false proposition, ingenious and plausible arguments.

And, a suitable term having been assigned to you to prepare your defense, you produced a certificate in the handwriting of his Eminence the Lord Cardinal Bellarmine,
procured by you, as you asserted, in order to defend yourself against the calumnies of your enemies, who charged that you had abjured and had been punished by the Holy Office, in which certificate it is declared that you had not abjured and had not been punished but only that the declaration made by His Holiness and published by the Holy Congregation of the Index had been announced to you, wherein it is declared that the doctrine of the motion of the Earth and the stability of the Sun is contrary to the Holy Scriptures and therefore cannot be defended or held. And, in this certificate there is no mention of the Two articles of the injunction, namely, the order not ‘to teach’ and ‘in any way’, you represent that we ought to believe that in the course of fourteen or sixteen years you had lost all memory of them and that this was why you said nothing of the injunction when you requested permission to print your book. And all this you urged not by way of excuse for your error but that it might be set down to a vainglorious ambition rather than to malice. But this certificate produced by you in your defense has only aggravated your delinquency, since, although it is there stated that said opinion is contrary to Holy Scripture, you have nevertheless dared to discuss and defend it and to argue its probability; nor does the license artfully and cunningly extorted by you avail you anything, since you did not notify the command imposed upon you. 

And whereas it appeared to us that you had not stated the full truth with regard to your intention, we thought it necessary to subject you to a rigorous examination at which (without prejudice, however, to the matters confessed by you and set forth as above with regard to your said intention) you answered like a good Catholic. Therefore, having seen and maturely considered the merits of this your case, together with your confessions and excuses above-mentioned, and all that ought justly to be seen and considered, we have arrived at the underwritten final sentence against you:

Invoking, therefore, the most holy name of our Lord Jesus Christ and of His most glorious Mother, ever Virgin Mary, by this our final sentence, which sitting in judgment with the counsel and advice of the Reverend Masters of sacred theology and Doctors of both Laws, our assessors, we deliver in these writings, in the cause and causes at present before us between the Magnificent Carlo Sinceri, Doctor of both Laws, Proctor Fiscal of this Holy Office, of the one part, and you Galileo Galilei, the defendant, here present, examined, tried, and confessed as shown above, of the other part--

We say, pronounce, sentence, and declare that you, the said Galileo, by reason of the matters adduced in trial, and by you confessed as above, have rendered yourself in the judgment of this Holy Office vehemently suspected of heresy, namely, of having believed and held the doctrine—which is false and contrary to the sacred and divine Scriptures—that
the Sun is the center of the world and does not move from east to west and that the Earth moves and is not the center of the world; and that an opinion may be held and defended as probable after it has been declared and defined to be contrary to the Holy Scripture; and that consequently you have incurred all the censures and penalties imposed and promulgated in the sacred canons and other constitutions, general and particular, against such delinquents. From which we are content that you be absolved, provided that, first, with a sincere heart and unfeigned faith, you abjure, curse, and detest before us the aforesaid errors and heresies and every other error and heresy contrary to the Catholic and Apostolic Roman church in the form to be prescribed by us for you.

And, in order that this your grave and pernicious error and transgression may not remain altogether unpunished and that you may be more cautious in the future and an example to others that they may abstain from similar delinquencies, we ordain that the book of the 'Dialogue of Galileo Galilei' be prohibited by public edict.

We condemn you to the formal prison of this Holy Office during our pleasure, and by way of salutary penance we enjoin that for three years to come you repeat once a week the seven penitential Psalms. Reserving to ourselves liberty to moderate, commute, or take off, in whole or in part, the aforesaid penalties and penance.

And so we say, pronounce, sentence, declare, ordain, and reserve in this and in any other better way and form which we can and may rightfully employ. 98

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98 Santillana 306-310.
"I, Galileo, son of the late Vincento Galilei, Florentine, aged seventy years, arraigned personally before this tribunal and kneeling before you, Most Eminent and Reverend Lord Cardinals Inquisitors-General against heretical privity throughout the entire Christian commonwealth, having before my eyes and touching with my hands the Holy Gospels, swear that I have always believed, do believe, and by God's help will in the future believe all that is held, preached, and taught by the Holy Catholic and Apostolic Church. But, whereas--after an injunction had been judicially intimated to me by this Holy Office to the effect that I must altogether abandon the false opinion that the Sun is the center of the world and immovable and that the Earth is not the center of the world and moves and that I must not hold, defend, or teach in any way whatsoever, verbally or in writing, the said false doctrine, and after it had been notified to me that the said doctrine was contrary to Holy Scripture--I wrote and printed a book in which I discuss this new doctrine already condemned and adduce arguments of great cogency in its favor without presenting any solution of these, I have been pronounced by the Holy Office to be vehemently suspected of heresy, that is to say, of having held and believed that the Sun is the center of the world and immovable and that the Earth is not the center and moves:

Therefore, desiring to remove from the minds of your Eminences, and of all faithful Christians, this vehement suspicion justly conceived against me, with sincere heart and unfeigned faith I abjure, curse, and detest the aforesaid errors and heresies and generally every other error, heresy, and sect whatsoever contrary to the Holy Church, and I swear that in future I will never again say or assert, verbally or in writing, anything that might furnish occasion for a similar suspicion regarding me; but should I know any heretic or person suspected of heresy, I will denounce him to this Holy Office or to the Inquisitor or Ordinary of the place where I may be. Further, I swear and promise to fulfil and observe in their integrity all penances that have been, or that shall be, imposed upon me by this Holy Office. And, in the event of my contravening (which God forbid!) any of these my promises and oaths, I submit myself to all the pains and penalties imposed and promulgated in the sacred canons and other constitutions, general and particular, against such delinquents. So help me God and these His Holy Gospels, which I touch with my hands." 99

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99 Santillana 312.