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The Trial of Galileo

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by Doug Linder (2002)

In the 1633 trial of Galileo Galilei, two worlds come into cosmic conflict. Galileo's world of science and humanism collides with the world of Scholasticism and absolutism that held power in the Catholic Church. The result is a tragedy that marks both the end of Galileo's liberty and the end of the Italian Renaissance.

Galileo Galilei was born in 1564--the same year that Shakespeare was born and Michelangelo died. From an early age, Galileo showed his scientific skills. At age nineteen, he discovered the isochronism of the pendulum. By age twenty-two, he had invented the hydrostatic balance. By age twenty-five, Galileo assumed his first lectureship, at the University of Pisa. Within a few more years, Galileo earned a reputation throughout Europe as a scientist and superb lecturer. Eventually, he would be recognized as the father of experimental physics. Galileo's motto might have been "follow knowledge wherever it leads us."

At the University of Padua, where Galileo accepted a position after three years in Pisa, he began to develop a strong interest in Copernican theory. In 1543, Nicolaus Copernicus published *Revolutions of the Celestial Orbs*, a treatise that put forth his revolutionary idea that the Sun was at the center of the universe and that the Earth--rotating on an axis--orbited around the sun once a year. Copernicus' theory was a challenge to the accepted notion contained in the natural philosophy of Aristotle, the astronomy of Ptolemy and the teachings of the Church that the sun and all the stars revolved around a stationary Earth. In the half-century since its publication, however, Copernicus' theory met mostly with skepticism. Skeptics countered with the "common sense" notion that the earth they stood on appeared not to move at all--much less at the speed required to fully rotate every twenty-four hours while spinning around the sun.

Sometime in the mid-1590s, Galileo concluded that Copernicus got it right. He admitted as much in a 1597 letter to Johannes Kepler, a German mathematician who had written about planetary systems: "Like you, I accepted the Copernican position several years ago and discovered from thence the cause of many natural effects which are doubtless inexplicable by the current theories." Galileo, however, continued to keep his thoughts to a few trusted friends, as he explained to Kepler: "I have not dared until now to bring my reasons and refutations into the open, being warned by the fortunes of Copernicus himself, our master, who procured for himself immortal fame among a few but stepped down among the great crowd."

Galileo's discovery of the telescope in 1609 enabled him to confirm his beliefs in the Copernican system and emboldened him to make public arguments in its favor. Through a telescope set in his garden behind his house, Galileo saw the Milky Way, the valleys and mountains of the moon, and--especially relevant to his thinking about the Copernican system--four moons orbiting around Jupiter like a miniature planetary system. Galileo, a

good Catholic, offered "infinite thanks to God for being so kind as to make me alone the first observer of marvels kept hidden in obscurity for all previous centuries." Galileo began talking about his observations at dinner parties and in public debates in Florence, where he has taken up a new post.

Galileo expected the telescope to quickly make believers in the Copernican system out of all educated persons, but he was disappointed. He expressed his discouragement in a 1610 letter to Kepler: "My dear Kepler, what would you say of the learned here, who, replete with the pertinacity of the asp, have steadfastly refused to cast a glance through the telescope? What shall we make of this? Shall we laugh, or shall we cry?" It became clear that the Copernican theory had its enemies.

Galileo's first instinct was turn to acquiring more knowledge for those few open minds he was able to reach--disciples such as monk Benedetto Castelli. Galileo wrote to Castelli: "In order to convince those obdurate men, who are out for the vain approval of the stupid vulgar, it would not me enough even if the stars came down on earth to bring witness about themselves. Let us be concerned only with gaining knowledge for ourselves, and let us find therein our consolation."

Soon, however, Galileo--flamboyant by nature--decided that Copernicus was worth a fight. He decided to address his arguments to the enlightened public at large, rather than the hidebound academics. He saw more hope for gaining support among businessmen, gentlemen, princes, and Jesuit astronomers than among the vested apologists of universities. He seemed compelled to act as a consultant in natural philosophy to all who would listen. He wrote in tracts, pamphlets, letters, and dialogues--not in the turgid, polysyllabic manner of a university pedant, but simply and directly.

The Admonition and False Injunction of 1616

In 1613, just as Galileo published his *Letters on the Solar Spots*, an openly Copernican writing, the first attack came from a Dominican friar and professor of ecclesiastical history in Florence, Father Lorini. Preaching on All Soul's Day, Lorini said that Copernican doctrine violated Scripture, which clearly places Earth, and not the Sun at the center of the universe. What, if Copernicus were right, would be the sense of Joshua 10:13 which says "So the sun stood still in the midst of heaven" or Isaiah 40:22 that speaks of "the heavens stretched out as a curtain" above "the circle of the earth"? Pressured later to apologize for his attack, Lorini later said that he "said a couple of words to the effect that the doctrine of Ipernicus [sic], or whatever his name is, was against Holy Scripture."

Galileo responded to criticism of his Copernican views in a December 1613 *Letter to Castelli*. In his letter, Galileo argued that the Scripture--although truth itself--must be understood sometimes in a figurative sense. A reference, for example, to "the hand of God" is not meant to be interpreted as referring to a five-fingered appendage, but rather to His presence in human lives. Given that the Bible should not be interpreted literally in every case, Galileo contended, it is senseless to see it as supporting one view of the

physical universe over another. "Who," Galileo asked, "would dare assert that we know all there is to be known?"

Galileo hoped that his *Letter to Castelli* might foster a reconciliation of faith and science, but it only served to increase the heat. His enemies accused him of attacking Scripture and meddling in theological affairs. One among them, Father Lorini, raised the stakes for the battle when, on February 7, 1615, he sent to the Roman Inquisition a modified copy of Galileo's *Letter to Castelli*. He attached his own comments to his submission:

> All our Fathers of this devout convent of St. Mark are of opinion that the letter contains many propositions which appear to be suspicious or presumptuous, as when it asserts that the language of 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 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 matters of religion....When, I say, I became aware of all of this, I made up my mind to acquaint your Lordship with the state of affairs, that you in your holy zeal for the Faith may, in conjunction with your illustrious colleagues, provide such remedies as may 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.

In fact, Lorini's letter appears more charitable than he in fact was. He would stop at almost nothing to destroy the "Galileists," as is shown from his alteration--in certain key places--of the text of Galileo's Letter to Castelli. For example, where Galileo had written: "There are in Scripture words *which, taken in the strict literal meaning, look as if they differed from the truth*," Lorini substituted: "*which are false in their literal meaning*." However unscrupulous his methods, Lorini's denunciation succeeded in setting the machinery of the Catholic Church in motion.

Lorini had allies, such as Father Tommaso Caccini. Caccini traveled to Rome to appear before the Holy Office and expose, as he saw it, "the errors of Galileo." Called for examination on March 20, Caccini said that Florence was full of "Galileists" publicly declaring God to be an accident and doubting miracles. Caccini placed full blame for the sorry state of affairs on Galileo. Asked the basis for his report, Caccini credited Lorini and a Father Ximenes. Overall, the condemnation was hardly convincing. Giorgio de Santillana, author of *The Crime of Galileo*, wrote of Caccini's testimony: "The whole deposition is such an interminable mass of twists and innuendoes and double talk that a summary does no justice to it."

Matteo Caccini, Tommaso's brother, fumed when he learned of his brother's denunciation of Galileo. He described his brother as "lighter than a leaf and emptier than a pumpkin." In an April letter he wrote of his Tommaso's action: "As to F. T., I am so angry that I could not be more, but I don't care to discuss it. He opened up with me in private the other day, and he revealed such dreadful plans that I could scarcely control myself. In any event, I wash my hands of him forever and ever."

Aware of the move against him, Galileo wrote to a friend, Monsignor Dini, asking that his letters be forwarded to the influential Cardinal Bellarmine, the Church's chief theologian, and--if it could be arranged--Pope Paul V. Unfortunately for Galileo, the seventy-four-year old Cardinal Bellarmine "was no friend of novelties" (although, unlike some of Galileo's other detractors, he had at least looked through a telescope and given--in 1611--an audience to Galileo). In his innate conservatism he saw the Copernican universe as threatening to the social order. To Bellarmine and much of the Church's upper echelon, the science of the matter was beyond their understanding--and in many cases their interest. They cared about administration and preserving the power of the papal superstate more than they did getting astronomical facts right.

Bellarmine stated his views on the Galileo controversy in an April 12, 1615 letter to Father Foscarini, a highly-respected monk from Naples. He indicated that Galileo could speak about the Copernican model "hypothetically, and not absolutely." Bellarmine wrote that "to affirm that the Sun, in its very truth, is at the center of the universe...is a very dangerous attitude and one calculated not only to arouse all Scholastic philosophers and theologians but also to injure our faith by contradicting the Scriptures."

With "nineteen centuries of organized thought piling up to smother him," Galileo pleaded--in a powerful summary of thoughts on Scriptural interpretation and the evidence concerning the nature of the universe--his case in his *Letter to the Grand Duchess*. He asked that his idea not be condemned "without understanding it, without hearing it, without even having seen it." Galileo's eloquent *Letter* was forwarded to Rome where, in the words of one historian, "it sank out of sight as softly as a penny in a snowbank."

When depositions in the Galileo matter concluded, the Commissary-General forwarded two propositions of Galileo to eleven theologians (called "Qualifiers") for their evaluation: (1) The Sun is the center of the world and immovable of local motion, and (2) The Earth is not the center of the world, nor immovable, but moves according to the whole of itself, also with a diurnal motion. Four days later, on February 23, 1616, the Qualifiers unanimously declared both propositions to be "foolish and absurd" and "formally heretical." Less than two weeks later, Pope Paul V--described by the Florentine ambassador as "so averse to anything intellectual that everyone has to play dense and ignorant to gain his favor"--endorsed the theologian's conclusions. The Pope, according to the Inquisition file, "directed the Lord Cardinal Bellarmine to summon before him the said Galileo and admonish him to abandon the said opinion; and, in the case of his refusal to obey, the Commissary of the Holy Office is to enjoin him...to abstain altogether from teaching or defending this opinion and even from discussing it."

Summoned before Bellarmine on February 25, 1616 and admonished, Galileo--according to a witness, Cardinal Oregius--"remained silent with all his science and thus showed that no less praiseworthy than his mind was his pious disposition." Oregius' account, and Galileo's own writings, indicate that Galileo did not "refuse to obey" the Church's admonition. It is assumed, therefore, that Galileo was not formally enjoined. Yet, surprisingly, in the Inquisition file there appeared the following entry:

At the palace, the usual residence of Lord Cardinal Bellarmine, the said Galileo, having been summoned and being present before the said Lord Cardinal, was...warned of the error of the aforesaid opinion and admonished to abandon it; and immediately thereafter...the said Galileo was by the said Commissary *commanded and enjoined*, in the name of His Holiness the Pope and the whole Congregation of the Holy Office, to relinquish altogether the said opinion that the Sun is the center of the world and immovable and that the Earth moves; nor further to hold, teach, or defend it in any way whatsoever, verbally or in writing; otherwise proceedings would be taken against him by the Holy Office; which injunction the said Galileo acquiesced in and promised to obey. Many things about the entry are suspicious. It appears in the Inquisition file where one would expect the actual Bellarmine injunction (if it existed) to appear. Moreover, the entry appears on the same page as the entry for the previous day--and every other report, legal act, and entry in the entire file begins at the top of a new page. It is widely believed by historians that the reported injunction of Galileo was "a false injunction": the injunction never happened, but a false report was maliciously planted in the file by one of Galileo's enemies. Seventeen years later, Galileo would stand before the Inquisition charged with violating an injunction that was, in all likelihood, never issued against him.

The Trial of 1633

Galileo's admonition stopped the Copernican movement dead in its tracks. For Galileo, his admonition marked the beginning of a period of silence. He busied himself with such tasks as using tables of the moons of Jupiter to develop a chronometer for measuring longitude at sea. He endured his rheumatism, enjoyed the attention of his daughter, Maria Celeste, and adjusted to a world which elevated mindless conformism over scientific understanding.

In 1623, Galileo received some hopeful news: Cardinal Maffeo Barberini had been elected Pope. Unlike the dull and mean-tempered Pope Paul V, the new Pope Urban VIII held a generally positive view of the arts and science. Writing from Rome, the Pope's private secretary, Secretary of the Briefs Ciampoli, urged Galileo to resume publication of his ideas: "If you would resolve to commit to print those ideas that you still have in mind, I am quite certain that they would be most acceptable to His Holiness, who never ceases from admiring your eminence and preserves intact his attachment for you. You should not deprive the world of your productions."

In the early years of his reign, Pope Urban VIII held long audiences with Galileo. Encouraged by a Pope who seemed open to renewed debate on the merits of the Copernican system (so long as the arguments fell short of purporting to be a definite refutation of the Earth-centered universe), Galileo began work on a book that would eventually prove his undoing, *Dialogue Concerning the Two Chief World Systems.*

On December 24, 1629, Galileo told friends in Rome that he had completed work on his 500-page *Dialogue.* The *Dialogue* has been described as "the story of the mind of Galileo." The book reveals Galileo as physicist and astronomer, sophisticate and sophist, polemicist and polished writer. Unlike the works of Copernicus and Kepler, Galileo's

Dialogue was a book for the educated public, not specialists. Although using the form of a debate among three Italian gentlemen, Galileo marshaled a variety of arguments to lead his readers to one inexorable conclusion: Copernicus was right. The character Salviati, a person of "sublime intellect," clearly speaks for Galileo in arguing for a Sun-centered system. Sagredo is a Venetian nobleman, open-minded and hesitant to draw conclusions--a good listener. Simplico is the straw man of the debate, a stubborn, literal-minded defender of the Earth-centered universe.

Early news from Rome gave Galileo reason for optimism that his book would soon be published. The Vatican's chief licenser, Niccolo Riccardi, reportedly promised his help and said that theological difficulties could be overcome. When Galileo arrived in Rome in May 1630, he wrote: "His Holiness has begun to treat of my affairs in a spirit which allows me to hope for a favorable result." Urban VIII reiterated his previously stated view that if the book treated the contending views hypothetically and not absolutely, the book could be published.

Reading the book for the first time, chief licenser Riccardi came to see the book as less hypothetical--and therefore more problematic--than he expected it to be. Riccardi demanded that the Preface and conclusion to revised to be more consistent with the Pope's position. In August 1630, in the midst of his required revising, Galileo received a letter from his friend Benedetto Castelli in Rome urging him, for "weighty reasons" which he "not wish to commit to paper," to print the *Dialogue* in Florence "as soon as possible." Galileo's Jesuit opponents in Rome were aiming to block publication.

Riccardi seemed paralyzed with indecision. Caught between two powerful forces, he did nothing as Galileo fretted that his great work might never see the light of day. "The months and the years pass," Galileo complained, "my life wastes away, and my work is condemned to rot."

Finally, reluctantly ("dragged by the hair," according to one account), Riccardi gave the green light. The first copy of Galileo's *Dialogue Concerning the Two Chief World Systems* came off the press in February 1632. The book, which quickly sold out, soon became the talk of the literary public.

By late summer, Galileo's hopes turned to fears when he learned that orders had come from Rome to suspend publication of his book. On September 5, the full scope of Galileo's problems became clearer when Pope Urban told Francesco Niccolini, who had come to the Vatican to protest the suspension decision, "Your Galileo has ventured to meddle in things that he ought not and with the most grave and dangerous subjects that can be stirred up these days." Jesuit enemies of Galileo had convinced the Pope that the *Dialogue* was nothing but a thinly-veiled brief for the Copernican model. The Pope complained that Galileo and Ciampoli deceived him, assuring him that the book would comply with papal instructions and then circumventing them. The Pope seemed especially embittered by Galileo's decision to put the Pope's own argument concerning the tides into the mouth of the simple-minded Simplico--an attempt, as he saw it, to ridicule him.

The Pope swung the machinery of the Church into motion. He appointed a special commission to investigate the Galileo matter. Riccardi, the chief licenser, was severely lectured. Ciampoli was exiled to obscure posts, never to return to Rome.

Galileo, too, became angry. His noble goal of spreading scientific awareness to the public was being frustrated by a narrow-minded bureaucracy intent on preserving its own power. He believed he had done no wrong. He had been authorized to write about Copernicanism, had followed the required form, revised his work to meet censors' objections, and obtained a license. What more could authorities expect? How could the law reach him when he had acted with such care?

The water in which Galileo found himself soon became even deeper. The special commission's report to the Pope outlined a series of indictments against Galileo. On September 15, the Pope turned the matter over to the Inquisition. Eight days later, the General Congregation declared--in what would come as a shock to Galileo--that he had violated the 1616 (so-called) injunction against teaching, holding, or writing about Copernican theory.

On October 1, 1632, the Inquisitor of Florence showed up at Galileo's house with a summons to present himself to the Holy Office in Rome within a month. In despair, Galileo expressed regret for involving himself with the Copernican cause: "I curse the time devoted to these studies in which I strove and hoped to move away somewhat from the beaten path. I repent having given the world a portion of my writings; I feel inclined to consign what is left to the flames and thus placate at last the inextinguishable hatred of my enemies." The fire left his belly. He declined urgings to escape to the Venetian territory and instead asked that proceedings against him be moved to Florence. His request was denied: the Pope insisted that the old man, weak and ill though he was, make the two-hundred mile wintertime journey to Rome.

On February 13, 1633, Galileo completed his twenty-three day trip to Rome and took up lodging in the Florentine embassy. It was not a good time. The Grand Duke reported that Galileo "for two nights continuous...cried and moaned in sciatic pain; and his advancing age and sorrow." His only consolation during his stay at the embassy seemed to be that soon he would finally have a chance to defend his science and theology.

On April 8, Niccolini informed Galileo that he would stand trial before ten cardinals. A more difficult chore for Niccolini was to break the news to him that the merits of his case--as a practical matter--had been decided already; all he could do was submit.

Four days later, Galileo officially surrendered to the Holy Office and faced Father Firenzuola, the Commissary-General of the Inquisition, and his assistants. Firenzuola informed Galileo that for the duration of the proceedings against him he would be imprisoned in the Inquisition building. After putting Galileo under oath, the Commissary deposed Galileo concerning meetings he held with Cardinal Bellarmine and other church officials in 1616. Galileo seemed to have trouble remembering who might have been present with Bellarmine on that fateful February day seventeen years earlier, as well as

exactly what restrictions--if any--had been placed upon him. Firenzuola told Galileo that he had been commanded to "neither hold, defend, nor teach that [the Copernican] opinion in any way whatsoever." Galileo quibbled with the language--suggesting "I do not remember...the clause "in any way whatsoever"--, but accepted most of what the Commissary said. After a series of questions concerning the licensing of the *Dialogue*, Galileo signed his deposition in a shaking hand.

Three counselors to the Inquisition, driven especially by Galileo-hating Melchior Inchofer, prepared a seven-page evaluation of the *Dialogue*. The report concluded that in the book Galileo taught, defended, and showed that he held Copernican theory, and that--while claiming to discuss world models hypothetically--he gave the Copernican model "a physical reality."

Weeks past as internal debates raged over what the Inquisitors should do with their old scientist. Finally, Cardinal Francesco Barberini, a moderating influence on the panel of ten judges deciding Galileo's fate, persuaded the Commissary to meet with Galileo and convince him to admit error in return for a more lenient sentence. In a letter written by the Commissary (and not discovered until 1833), Firenzuola described his April 27 discussion with Galileo: "I entered into discourse with Galileo yesterday afternoon, and after 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."

Some historians have seen Galileo's decision to admit error as a "final self-degradation." Others, including Giorgio de Santillana, have seen it as the only rational move open to him: "He was not a religious visionary being asked to renounce his vision. He was an intelligent man who had taken heavy risks to force an issue and to change a policy for the good of his faith. He had been snubbed; he had nothing to do but pay the price and go home. The scientific truth would take care of itself."

The trial by the Congregation moved to its conclusion. Several of the ten cardinals apparently pushed for Galileo's incarceration in prison, while those more supportive of Galileo argued that--with changes--the Dialogue ought to continue to be allowed to circulate. In the end, a majority of the cardinals--rejecting much of the Commissary's agreement with Galileo--demanded Galileo "even with the threat of torture...abjure in a plenary assembly of the Congregation of the Holy Office...[and] then be condemned to imprisonment at the pleasure of the Holy Congregation." Moreover, the cardinals declared, the Dialogue "is to be prohibited."

The grand play ran its course, with the Pope insisting upon a formal sentence, a tough examination of Galileo, public abjuration, and "formal prison." Galileo was forced to appear once again for formal questioning about his true feelings concerning the Copernican system. Galileo obliged, so as not to risk being branded a heretic, testifying that "I held, as I still hold, as most true and indisputable, the opinion of Ptolemy, that is to say, the stability of the Earth and the motion of the Sun." Galileo renunciation of Copernicanism ended with the words, "I affirm, therefore, on my conscience, that I do

not now hold the condemned opinion and have not held it since the decision of authorities....I am here in your hands--do with me what you please."

On the morning of June 22, 1633, Galileo, dressed in the white shirt of penitence, entered the large hall of the Inquisition building. He knelt and listened to his sentence: "Whereas you, Galileo, the son of the late Vincenzo Galilei, Florentine, aged seventy years, were in the year 1615 denounced to this Holy Office for holding as true the false doctrine....." The reading continued for seventeen paragraphs:

> And, so that you will be more cautious in future, and an example for others to abstain from delinquencies of this sort, we order that the book *Dialogue of Galileo Galilei* be prohibited by public edict. We condemn you to formal imprisonment in this Holy Office at our pleasure.
>
> As a salutary penance we impose on you to recite the seven penitential psalms once a week for the next three years. And we reserve to ourselves the power of moderating, commuting, or taking off, the whole or part of the said penalties and penances.
>
> This we say, pronounce, sentence, declare, order and reserve by this or any other better manner or form that we reasonably can or shall think of. So we the undersigned Cardinals pronounce.

Seven of the ten cardinals signed the sentence.

Following the reading of the sentence, Galileo knelt to recite his abjuration:

> ....[D]esiring to remove from the minds of your Eminences, and of all faithful Christians, this strong suspicion, reasonably conceived against me, with sincere heart and unfeigned faith I abjure, curse, and detest the aforesaid errors and heresies, and generally every other error and sect whatsoever contrary to the said Holy Church; and I swear that in the future I will never again say or assert, verbally or in writing, anything that might furnish occasion for a similar suspicion regarding me....
>
> I, the said Galileo Galilei, have abjured, sworn, promised, and bound myself as above; and in witness of the truth thereof I have with my own hand subscribed the present document of my abjuration, and recited it word for word at Rome, in the Convent of Minerva, this twenty-second day of June, 1633.
>
> I, Galileo Galilei, have abjured as above with my own hand.

Two days later, Galileo was released to the custody of the Florentine ambassador. Niccolini described his charge as "extremely downcast over his punishment." After six days in the custody of Niccolini, custody of Galileo transferred to Archbishop Piccolomini in Sienna. In late 1633, Galileo received permission to move into his own small farmhouse in Arcetri, where he would grow blind and, in 1641, die.

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