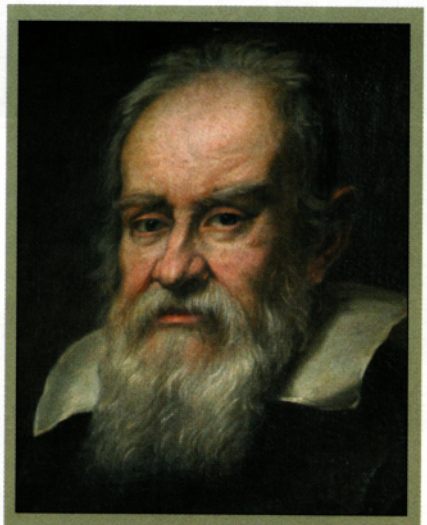
SCIENCE

Myths About the Galileo Affair

The Vatican hopes that an upcoming conference in Florence will dispel some of them.



The 1635 portrait of astronomer Galileo Galilei by Dutch painter Justus Sustermans.

by John Farrell

The International Astronomical Union and UNESCO have declared 2009 the International Year of Astronomy, and conferences and celebrations are taking place the world over to commemorate the achievements and raise public awareness of the astronomical sciences. In Rome, the focus is not just on astronomy, but on one of its greatest practitioners, Galileo Galilei.

The legend that Galileo Galilei invented the telescope remains a favorite, though historians have long known that at least one or more spectacle makers in Holland developed it in 1608, more as a toy than a tool. Galileo improved upon the initial design, grinding his own concave lenses and used the telescope to observe the craters on the moon and the moons of Jupiter. His acclaimed *Siderius Nuncius* ("The Starry Messenger") contained these detailed observations.

Other much darker legends surrounding Galileo also persist, and the Vatican hopes that a renewed focus on his work and on his infamous trial and the events surrounding it will dispel some of them. To take one example: Was Galileo ever tortured by the Inquisition for his belief in Copernicus' heliocentric system? No. Was he shown the instruments of torture? Unknown, but most scholars think not. Was he cross-examined with the implicit threat that he could be tortured if he was obstinate? Yes.

Of the many conferences this year, the Stensen Institute's International Congress, "The Galileo Affair: A Historical, Philosophical, and Theological Re-Examination" (taking place in Florence May 26-30) promises to draw the closest interest, for it is here that historians, scientists, and theologians will present an analysis of the case of Galileo more detailed than any offered since the late Pope John Paul II's special commission in 1992.

That commission did not come to a satisfying conclusion, according to many scholars, as it left the impression that the Church opposed heliocentrism for lack of conclusive proof and that Galileo never grasped the distinction between a mathematical hypothesis and a physical theory about the natural world.

Participants at the Stensen Institute's conference in May hope for a more detailed accounting about the circumstances surrounding Galileo's trial. The larger questions that will preoccupy them are: what actually led to the trial, why it happened, and whether it was unavoidable.

Space does not permit an exhaustive account of Galileo's case, but certain key events can be briefly reviewed.

The initial injunction issued by the Index of the Holy Office against Copernicus' famous book was issued on March 5, 1616. It declared heliocentrism "false and altogether opposed to Holy Scripture." Galileo was never named in this injunction and it's probable no injunction would have been issued in the first place had Galileo not insisted on pressing the case for Copernicus publicly.

He had for some years been irritating Dominican preachers who felt his meddling in theology to be ill-mannered. In particular they objected to his "Letter to Castelli" (later augmented and published as "Letter to the Grand Duchess Christina") in which he argued that there was no intrinsic conflict between revelation and the findings of natural philosophy, and that where it appeared so, given the facts, Scripture should be interpreted to accommodate the facts of science.

Two other books besides Copernicus', both written by theologians interested in reconciling Scripture with heliocentrism, were also scrutinized at that time: Father Diego Zuniga's *Commentary on Job*, which was, like Copernicus' book, prohibited until further correction, and Father Paolo Foscarini's *Opinion of the Pythagoreans and Copernicus*, which was banned outright. It's worth pointing out that having your book put on the Index did not automatically imply heresy; Cardinal Bellarmine, the head of the Holy Office (of the Inquisition), himself had books rejected by the Index.

Bellarmine wrote to Father Foscarini a very courteous letter on the 12th of April, 1615, explaining his misgivings:

> I say that, as you know, the Council [of Trent] prohibits expounding the Scriptures contrary to the common agreement of the holy Fathers. And

if Your Reverence would read not only the Fathers but also the commentaries of modern writers on Genesis, Psalms, Ecclesiastes, and Josue, you would find that all agree in explaining literally (*ad litteram*) that the sun is in the heavens and moves swiftly around the earth, and that the earth is far from the heavens and stands immobile in the center of the universe. Now consider whether in all prudence the Church could encourage giving to Scripture a sense contrary to the holy Fathers and all the Latin and Greek commentators. Nor may it be answered that this is not a matter of faith, for if it is not a matter of faith from the point of view of the subject matter, it is on the part of the ones who have spoken. It would be just as heretical to deny that Abraham had two sons and Jacob twelve, as it would be to deny the virgin birth of Christ, for both are declared by the Holy Ghost through the mouths of the prophets and apostles.

While Bellarmine admitted the interpretation of certain scriptural passages would have to be reconsidered in light of irrefutable evidence, he not only didn't think heliocentrism's supporters had offered such proof (which was true; up to that point Galileo had not), but thought that by definition, since the theory was considered a mathematical contrivance, *they never would*. Galileo believed heliocentrism was more than a useful mathematical hypothesis. Copernicus did too, but he and his book escaped censure for a century after publication because of the assuaging preface that his admirer Osiander added to the book to ward off the suspicion that Copernicus actually believed his theory had a physical basis in reality.

Pope Paul V asked Bellarmine to deliver a warning in person to Galileo to cease promoting his hypothesis. But the meeting has been a source of controversy as the documents about it are not consistent with each other.

On February 26, 1616, Bellarmine received Galileo at his residence and warned him not to advocate publicly Copernicanism. Galileo reportedly assented to this warning, according to three recorded accounts of the meeting in the archives of the Holy Office. But there is no agreement as to how absolute Bellarmine was in his statement—meaning that while Galileo could not publicly hold or teach the doctrine, he was not necessarily constrained from writing about it. The Commissioner of the Holy Office, the Dominican Father Seghizzi, was also present, and according to one memo of the event, which was once considered a forgery by 19th-century historians because it was not signed, Seghizzi made it clear to Galileo that he was not to defend Copernicanism *in any way, verbally or in writing*. This memo, which Galileo testified years later he could not remember, is the document that ultimately doomed him.

With the public injunction issued, Galileo felt discouraged but not dissuaded. Some weeks after his meeting with the cardinal, Galileo requested and received from Bellarmine written assurance that he was not formally under suspicion of heresy. Galileo cited that letter as his main justification when he later published his *Dialogue on the Two Chief World Systems*.

Galileo was brilliant—and impatient. When one considers what he knew and what he should have known, it's hard not to conclude that the later trial of 1633 should never have taken place.

For example, although he had been corresponding over the years with Johannes Kepler, the German mathematician and astronomer, Galileo never paid careful attention to Kepler's supposition—which Galileo knew of as early as 1612—that if one considered the orbits of the planets to be elliptical rather than purely circular (a classical bias going back to Aristotle and before), then all known observational data about the planets fit a heliocentric model, without any epicycles or other mathematical contrivances to get the right predictions.

For whatever reason, Galileo discounted this because he believed all planetary motions had to be circular. Instead, he pressed ahead with an unconvincing argument based on a theory of tides that ignored what even the most old-fashioned astronomers realized, that the moon had to be a factor in any explanation. Galileo argued instead that the tides were caused by a type of inertial reaction of the oceans back and forth caused by the earth's rotation.

He proceeded to write and push for publication of his famous *Dialogue*. By this time, his friend and admirer, Cardinal Maffeo Barberini, who had never been comfortable with Pope Paul's hostility to Copernicanism, had become Pope Urban VIII. Urban appreciated

Galileo's achievements, and granted him six audiences in the early years of his papacy. While he did not directly encourage Galileo to write his book, and his own reservations about Copernicus were less scriptural than Bellarmine's, he told Galileo one could not press too absolutely about physical theories, as humanity probably was not capable of grasping just how God might have constructed the heavens. Galileo felt encouraged to take advantage of this cordial disagreement, and proceeded with his book. He never mentioned any explicit warning as summarized in the unsigned archive memo.

In 1632, after long finagling, he gained not only an imprimatur from the Master of the Sacred Palace in Rome (chief book censor), but one from the censor in Florence as well. The book was an immediate sensation.

Dialogue Concerning the Two Chief World Systems recounts the discussions of three philosophers over the course of four days: Salviati, who takes the position of Galileo arguing in favor of heliocentrism; Sagredo, a neutral party interested in both sides; and Simplicio, the complacent spokesman who stood for the old Ptolemaic system. Needless to say, Simplicio would not get the better of anyone in the arguments, and toward the close of the book, it was obvious to many friends of Galileo and the Pope that the latter's earlier reservations about Copernicus were repeated almost verbatim by the hapless conservative.

Once the whispering began about the book, Urban, now preoccupied with the Thirty Years War and other matters, appointed a panel of three in the summer of 1632 to examine the book and its origin more closely. The Holy Office suspected that Galileo had violated the explicit injunction not to hold or teach Copernicus "in any way."

Historians describe an upset Pope Urban, angry that Galileo had placed his words in the mouth of Simplicio. This has a certain gossipy appeal, but this description demeans the Pope, who actually had more material reasons for feeling betrayed.

What led to his wrath and Galileo's summons to Rome was the discovery in the Holy Office's archives of the aforementioned injunction (it was discovered in the summer of 1632). Pope Urban had reason to believe it was served directly to Galileo by the Dominicans in Cardinal Bellarmine's presence.

Galileo initially testified he couldn't recall receiving it, but later admitted it was possible and that he had forgotten about the meeting. He was 70 years old by the time of his trial, in ill health, and it had been 16 years since the initial meeting with Bellarmine, now deceased. Pope Urban felt Galileo had made him look like a fool by never once mentioning the injunction during all those pleasant audiences.

Urban ordered the Holy Office to cross-examine Galileo, who after months of delay, came to Rome in the spring of 1633. The Pope and the Office believed he had acted in bad faith, and with some deceit.

As noted before, Galileo felt Bellarmine's letter gave him the wiggle room he needed to proceed. But any attempt to come to a plea bargain with the Inquisitors was abruptly aborted. He was found guilty of violating the injunction of 1616. He was ordered to abjure heliocentrism as false and contrary to Scripture. He was further condemned to be imprisoned, but his supporters convinced the still smoldering Pope to commute his sentence to house arrest for the remainder of his life.

Two points are noteworthy. It's clear to scholars who have studied the summary judgment drafted by the Holy Office that it was uncharacteristically biased. Not only were distorted quotes from Galileo offered to justify its case, but long-discredited attacks on his character were dug up to help clinch the point. Galileo was never allowed to see this document, and its authors in the Holy Office purposefully left it unsigned. What's puzzling is why the gratuitous slanders were added to the summary judgment when there was enough straightforward evidence to assure Galileo's guilt.

The second point—and most likely the one action that more than anything has haunted the Church ever since—is why Urban vindictively ordered that Galileo's full abjuration, along with the declaration of his guilt, be copied and sent to every major Catholic educational institution in Europe. This was unprecedented and cooler heads among the cardinal judges of the Inquisition (including the Pope's own nephew) disapproved of it.

Galileo lived out his remaining years working on a new book, which turned out to be his greatest: *Discourse and Mathematical Demonstrations on Two New Sciences*. It was published in Holland in 1638, four years before he died.

Some defenders of the Church's treatment of Galileo have argued that Galileo was condemned because he never produced convincing enough proof of Copernicus' theory. Father Sabino Maffeo, current head of the Vatican Observatory, suggested this to Carol Glatz of Catholic News Service last year. "Not having proof...(the Holy Office) was forced to hold on to the centuries-old concept that saw Earth as the center of the cosmos," he told her (March 7, 2008).

This can't be right. As we've seen, the injunction of 1616 made no mention of the data involved in the theory, but bluntly condemned it as "false and altogether opposed to Holy Scripture." The directive to Galileo forbade any research into the matter.

The question at the heart of the 1616 injunction—and indeed at the heart of Galileo's trial—centered on the Church's authority to interpret Scripture, not on the freedom of scientists and philosophers to offer their own interpretations. At the time, the Church decided to interpret Scripture with literal emphasis in accord with the guidelines laid down by the Council of Trent, which were designed to meet the objection of the Reformers that the Church's understanding of the Bible had grown lax.

As Cardinal Bellarmine made clear in his 1615 letter to Father Foscarini, not only did he not believe the Copernican theory had enough proof at the time—he denied in principle that it ever would. This hardly supports the contention that the Church was waiting for proof.

There is some irony here, because for most of its history, the Church did interpret Scripture more as Galileo suggested in his "Letter to the Grand Duchess." There were precedents (Galileo took his inspiration from St. Augustine), and the Church more formally recognized this approach after Leo XIII issued *Providentissimus Deus*.

Will the Stensen Institute's conference throw some new light on the Galileo affair? Let's hope so, for the real story of Galileo and the Church is far more thought-provoking than any of the stale "myths" about it. ■

JOHN FARRELL *is the author of* The Day Without Yesterday: Lemaître, Einstein, and the Birth of Modern Cosmology *(Basic Books).*