GALILEO'S ENDURING CAREER

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Galileo Galilei stands as the iconic figure in the war between science and religion. It is a war however in which the battle lines have shifted from when the war first started, and nowhere is this more apparent than in the reputation of Galileo. From the beginning of the titanic controversy until recently, Galileo was seen as the hero of scientific truth, unfairly and reprehensibly attacked by the Church which acted out of fear and bigotry, a conflict which science had won and religion had lost. However, Galileo's career has endured well beyond his own lifetime and our understanding of it has undergone various transmutations for it contains such interest as it affects our understanding of the relation of scientific knowledge to religious knowledge. While the controversy in which Galileo embroiled both himself and the Church is now seen in a more subtle dimension and not in terms of a hero and assorted villains, Galileo's career still has forceful lessons to teach us about the relation of science to *The Bible*, and to society in general.

There are as it were many Galileos: Galileo as avatar of freedom of knowledge against religion and bigotry; Galileo as a clever and ambitious careerist who overtopped himself when he tried to trick the Pope; Galileo as atomist philosopher; Galileo as one of the great scientists of the "new physics" second in his accomplishments only to Newton; Galileo as victim of thought police, comparable to an old Bolshevik held prisoner in the Lubianka; Galileo a prisoner of conscience turned on by the authority whose thanks he merited like Oppenheimer and Sakharov; Galileo as scientific entrepreneur who sold the products of his research to support further scientific research; Galileo who like the atomic scientists in the 20th Century, adapted his new knowledge to the uses of war; Galileo disturber of social peace; and recently, Galileo as father to an intelligent and perceptive daughter [13]. Galileo's career endures because all these varying interpretations are suggested by elements plainly present in his career.

Galileo is a 17th Century figure and his career begins in the Renaissance at a time when religious wars were taking place by which time Protestantism had become firmly established in England and in northern Europe while Catholicism prevailed in Italy and parts of southern and central Europe. In this context of religious warfare, Galileo's insistence on promoting what many Catholics and Protestants both thought was a heretical doctrine was an irritant to both sides, an issue seemingly irrelevant to the major crisis of the day, but one which brought into sharp relief the issue of faith and reason. Added to the religious context was the secular context of the growth of capitalism and of a newly enriched and educated middle class which was challenging the old feudal political arrangement of lord and serf, a new arrangement which encouraged the belief in any individual's ability to succeed and find his place in life by his own efforts. In this combined religious and secular context, the case of Galileo had a deep resonance because of his condemnation by the Catholic Church, his victimhood as a prisoner of the dreaded Inquisition, and his ultimate vindication in the central matter of the Copernican theory, the discovery of which marked the beginning of modern science.

In the view which prevailed in modern society for three centuries, religious authority had persecuted Galileo, forcing him unjustly to abjure his belief in the Copernican system, but then religious authority had itself been punished by the vindication of Galileo's central premise, for the Earth did indeed travel around the Sun. Science, not religion would be the principal guide to the human race in its

search for knowledge and well-being in the modern age. Revealed knowledge, in the social form of the Catholic Church, had pronounced against secular knowledge and secular knowledge in the figure of Galileo, and had overcome it. After his conviction, Galileo became a hero while living in house arrest, using his remaining time (Galileo was an old man at this point) to conduct experiments and write serious scientific works in the form of dialogues. Galileo's house became a stop on the tour of the continent that young Englishmen took, the poet John Milton and philosopher Thomas Hobbes among them, to visit the old intellectual fighter whose career was a vindication of the new science and of freedom of thought. This is what may be called the "classical" or standard view of the Galileo controversy which was expressed in a sumptuous presentation on public television in 1974 entitled "The Ascent of Man" by writer and mathematician Jacob Bronowski. Bronowski said, "… there was never any doubt that Galileo would be silenced, because the division between him and those in authority was absolute. They believed that faith should dominate; and Galileo believed that truth should persuade" [2: p. 205].

There were details, however, which when presented by serious historians or Catholic scholars made it apparent that the story of Galileo was much more complex than this classical black and white image. For one thing, Galileo was by the time of his ultimate conflict with the Church a celebrity scientist, well known throughout Italy and Europe for his astronomical researches using the telescope, and his bitter controversies with philosophers, preachers and other astronomers. Galileo had an aggressive, humorous and vivid personality which made him welcome in the highest circles of society, and thus when a new pope was elected, a man of learning and sophistication who also traveled in high circles, he and Galileo were well known to each other, if not friends then friendly acquaintances. Yet it was this Pope, Urban VIII, who thought he had an understanding with Galileo and who when he discovered otherwise, took revenge by putting Galileo's case before the Inquisition.

It was the nature of this "understanding" with Urban VIII and Galileo's manipulation of it that brought him into conflict with the Church. The major issue was the course of the planets and the Sun in relation to each other, the two competing "world systems" [6] as Galileo called them, of the Copernican versus the Ptolemaic accounts. It was a scientific issue that had become a major social and religious issue and stands as *the* classic case of a conflict between religion and science, for *The Bible* had references that made it clear that in the view of the bible writers, the Sun made a daily circuit about the Earth and not the other way around. However, the texts in which this assumption occurred were not connected in a vital way to revealed doctrine, and the Church's attitude toward *The Bible* was that even though it is a revealed document every text of *The Bible* was not to be taken in the most literal sense and that certain texts of necessity had to be interpreted metaphorically or spiritually [1: pp. 72, 85]. However, the earth-centered interpretation of the biblical texts was reinforced by the philosophy of Aristotle which was influential in the universities of that day and which depended upon the astronomy of the ancient astronomer Ptolemy which was earth-centered. In Aristotle's vision, the Earth was the central sphere in a system of nested spheres identified with heavenly bodies including the Sun, the Moon, the planets and the stars.

Besides contradicting certain biblical texts and Aristotle's philosophy, the Copernican doctrine defended by Galileo contradicted the universally accepted "naive" notion of earth centeredness, for the Sun does appear to travel from sunup where it appears at dawn in the East, to noon where it is approximately overhead, to sunset where it sets in the West. To accept the Copernican system a person had to exercise a feat of imagination, that he lived on a huge ball which was turning on its axis while at the same time hurtling though space around the Sun in a combined double circular motion that somehow neither made objects on the Earth fly away into space, nor made the Earth itself crack up and disintegrate. Galileo had answered these and other such objections in his Dialog on the two Systems the

book that got him into such trouble with Pope Urban VIII and the Inquisition. The reason for the trouble was that in their earlier discussion about Galileo's projected book, the Pope had argued that the truth regarding the two world systems was ultimately beyond final answer, since physical issues could never be settled, and that ultimate truth was available only through revealed knowledge which was accepted on faith. Galileo seemingly agreed and the Pope therefore expected that the dialog would set off the two systems in opposition to each other without a declared winner. Instead however the total effect of the dialog was to vindicate the Copernican system and logically dismantle the Ptolemaic, thus violating what the Pope thought was the explicit agreement he had with Galileo. (Einstein writes that Galileo was "down-right roguish" in this regard [6: p. xi]). However legitimate the Pope's anger, all the more increased because only a close reading of Galileo's long and dense work would reveal its Copernican agenda, his response was plainly an overreaction. Despite his trickery, Galileo became after all, the victim if not the hero of the story.

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We live in a time when heroes are looked upon with suspicion and where revisionist accounts are written to show up heroes as not being very heroic. The same thing has happened to Galileo as to Thomas Jefferson or Harry Truman. As an example, Bertold Brecht's play "Galileo" is in effect an accusation of cowardice based on Galileo's not standing up to the Inquisition rather than abjuring the Copernican doctrine in order to save his liberty and his life. (Brecht, who lived under the protection of the East German Communist regime, would not seem to have good standing to make such an accusation). On a scholarly level, Galileo's reputation as an avatar of the freedom of scientific thought has been subject to revision from a variety of sources in the last 50 years, including most prominently the publication of The Crime of Galileo by Georgio de Santillana in 1955 [4]. Historians have become more aware of the complexities of the situation that Galileo and the Church were in at the time, and more willing to understand the point of view of the Church not as a matter of apologetics but as a matter of trying to better understand the events as they took place. DeSantillana, not a Catholic, could go so far as to evince sympathy for the Roman Inquisition which tried Galileo. Comparing his trial to the witch trials taking place in Boston at about the same time as Galileo's and to 20th Century Russian Communist show trials, he writes, "We must, if anything, admire the cautiousness and legal scruples of the Roman authorities in that civilized period" [4: p. 228]. DeSantillana's point is not to vindicate the Church's trial of Galileo but to understand it apart from the stereotype of dark ecclesiastical villains versus the single minded defender of scientific truth. A less condemnatory attitude toward the Church's role in Galileo's case can also be seen in the account by historian of science Charles C. Gillespie written in 1960 who argues that the conflict arose not because of irresolvable doctrinal differences, the Church already having in place a procedure for dealing with conflicts between biblical texts and proven scientific facts, but for personal and political reasons. "The drama between science and the Church, therefore, unfolds with that inevitability which is tragic because it arises from the characters of men rather than the necessity in things" [8: p. 48].

A further impetus to Galilean revisionism comes about from scientific rather than historiographic developments, from considerations of Einstein's Theory of Relativity. Relativity means, among other things, that there is no preferred observer and no place in the universe such as its center from which absolute measurements of physical phenomena can be made. In one presentation of relativity, Einstein compared his theory of relativity to what he termed "Galilean relativity" [3: p. 158], by which Einstein meant the manner in which Galileo compared relative motions and how they might be measured for

instance while looking at a ship at sea. On the ship, a sailor walks back and forth on the deck of the ship and can calculate the speed of his pace, while from the vantage point of an observer on shore, the motion of the sailor is a compound of his motion relative to the ship, plus the motion of the ship relative to the shore. But for Einstein, there is no final place from which measurements may be made to give the final and determinate description of the motions of the sailor or the ship, since the shore sits on the Earth which moves relative to the Sun which moves relative to the galaxy, etc. Such considerations are fatal for the Copernican debate which enmeshed Galileo and the Church if the issue is described as the absolute motion of the Earth and the Sun, since absolute motion does not exist in a relativistic account. Philosopher Karl Popper summarizes the relativistic view with characteristic accuracy.

In support of the view that Galileo suffered for the sake of a pseudo-problem it has been asserted that in light of a logically more advanced system of physics Galileo's problem has in fact dissolved into nothing. Einstein's general principle, one often hears, makes it quite clear that it is meaningless to speak of absolute motion, even in the case of rotation; for we can freely choose whatever system we wish to be (relatively) at rest. Thus Galileo's problem vanishes [11: p. 110].

Popper himself disagrees with this view for reasons that have to do with his Libertarian politics rather than his philosophy of science, but among those who thought that Einstein's relativity theory made the issue between Galileo and the Church moot was the late Astronomer Royal of England, Fred Hoyle [9: pp. 82-88]. The relativist point of view is an abstract one the realm of theoretical physics since it replaces lines of force from point to point with gravity fields, but at that most abstract level of physical theory, relativity does make the debate between the Copernican and Ptolemaic account moot. The relativistic issue goes beyond the range of physical theory to the question of who was right in terms of scientific methodology, the Pope who asserted to Galileo that the Copernican issue could never be resolved, or Galileo who thought that the result could be made definite. Here it seems that Urban VIII wins the argument, for he took the position not that the Earth centered system of Aristotle and Ptolemy was physically true because *The Bible* and the Aristotelian philosophy professors said so, but that the issue could never really be resolved. Like other learned religious believers of the time who considered the Copernican issue including John Milton who expressed his view in his Christian epic, "Paradise Lost," [10: Book VIII, lines 66-140, Angel Rafael to Adam], the issue of the relative motion of the Earth and the Sun did not appear to the Pope to impact the central religious concerns of the Christian faith which is based on the salvific life of Jesus Christ. To deny Christ's Resurrection would be to attack a central belief, but to assert that the Earth traveled about the Sun rather than the other way around was tangential to the faith. In short, religious knowledge could accommodate the likely fact of the truth of the Copernican system if it could be proved.

It might seem as if however much detail might be added to the historical record, that no serious commentator, especially a well regarded philosopher of science, would think to reverse the general understanding of the famous incident of Galileo's conflict with the Church. Nonetheless, Paul Feyerabend speaking of Galileo's trial says that Galileo was "treated rather mildly" but that "a small claque of intellectuals aided by scandal-hungry writers succeeded in blowing it up into enormous dimensions so that what was basically an altercation between an expert and an institution defending a wider view of things now almost looks like a battle between heaven and hell" [5: p. 13; see also *Galileo's Mistake: A New Look at the Epic Confrontation.* Wade Roland. Arcade, 2003].

Feyerabend was not a religious believer and not a defender of the Catholic Church or of religious belief generally. Instead his judgment reflects a view about scientific truth that is radical in the Enlightenment understanding but which is increasingly accepted today, namely that scientific truth has no more credibility or validity than truths reached by other means. Feyerabend explains that scientific

truth has always been subject to controls and influences from institutions outside science, as today when pharmaceutical companies keep secret research results about new drugs, or when the Department of Defense refuses access to encryption software deemed necessary for national security. In the Galileo case, the scientist had been instructed by Church authorities that he could only hold the Copernican theory as a hypothesis until he had actual scientific proof, proof which was lacking at the time. Also, as we have seen, Urban VIII's opinion about the inability to decide between the two competing doctrines is now more credible in light of Einstein's theory of relativity. Thus, Feyerabend concludes his discussion of Galileo: "To sum up: the judgment of the Church experts was scientifically correct and had the right social intention, viz. to protect people from the machinations of specialists. It wanted to protect people from being corrupted by a narrow ideology that might work in restricted domains but was incapable of sustaining a harmonious life" [5: p.137]. Feyerabend was an anarchist in his politics, a position which harmonized with his belief that no one social institution including science had a market on truth. In Feyerabend's treatment, Galileo becomes an example of the kind of expert whose doctrines are deleterious to the body politic and which should be constrained, rather than a hero of thought.

Ironically, 30 years after Feyerabend presented his argument that the Catholic Church's actions against Galileo had been justified, Pope John-Paul II in 1992 weighed in on the case, this time not to condemn Galileo but to apologize and correct the record by admitting to all those interested that Galileo's conviction in the Inquisitorial trial had been wrong. This exoneration was approximately came 400 years after the case but is still welcome, and was apparently part of John-Paul II's general agenda as leader of the Catholic Church to apologize to various groups offended by actions of the Church over the previous centuries including most appropriately, the Jewish people. Pope John-Paul II's motives were generous and irenically motivated, and it must be supposed that the fact that the relativistic interpretation of the case would let the Church off the hook as far as the scientific issue was concerned was not considered relevant or not understood. In fact, accepting that Urban VIII's idea of scientific explanation was superior to Galileo's does not exonerate Urban VIII or the Church from guilt in the manner in which Galileo was treated. Some scholars think that evidence was faked for the purposes of convicting Galileo, i.e. that unknown Church officials manufactured a fake letter purporting to show that 16 years earlier Cardinal Bellarmine had instructed Galileo not to hold the Copernican theory *in any way,* not even as a hypothesis [4: pp. 125-131]. This explanation seems likely since enforcing complete silence about the Copernican theory would deny access to the astronomical tables that Copernicus had produced in his book *De Revolutionibus* which were in use by mariners and ship's navigators.

All the interpretations of his career which have multiplied in recent times can be seen as a reflection of the fact that Galileo is the proto-scientist: the first modern scientist in his methodology, in his ruthless elimination of non-material causality in the physical universe, the first to come in full and fatal conflict with religious authority (not excluding Giordano Bruno whose doctrines were less scientific than magical and pantheistic), the first to hint at a world system expressed fully in mathematical terms, and the first to sell his research. Galileo is the scientist in full, exemplifying both the positive and negative qualities we now associate with modern science. Thus, it is only fair to give Galileo the last word, one that is particularly useful for a discussion of the contemporary conflicts, real and otherwise, between religious and secular knowledge. At one point prior to his trial, Galileo sent an open letter to a Princess named Christina, a dowager of the powerful Medici family, but this was not a personal letter but a long argumentative tract of over 14,000 words. Galileo had been accused by a preacher in her court of attacking *The Bible* by asserting doctrines that contradicted sacred scripture. Galileo naturally wanted to respond to the attack in order to protect his reputation but also because such an accusation could get him involved with Church authorities investigating heresy which eventually, of

course, did happen. The issue was the Copernican theory which Galileo had been able to support with many experimental and mathematical pieces of evidence and now his enemies, rebutted by his arguments, were reduced to attacking the Copernican theory as "damnable and heretical" because it appeared to contradict various biblical passages, including the account where Joshua makes the sun stand still until the Israelite army completes a mop up operation [Joshua, 10: 12-13].

Galileo defended himself by putting forward an extended argument that *The Bible* should not be used as a text to decide scientific issues since it often happened that the biblical writers had to explain things in terms which was understood by ancient Israelites, Greeks, Romans, Abyssinians, etc. Galileo's position regarding the use of biblical texts in scientific research is widely accepted among Christian theologians today [12], but was itself based on the traditional teaching of the Church authorities including Bonaventure, Aquinas and Augustine, that secular knowledge was usually required to understand and interpret biblical texts and to decide whether texts were to be interpreted metaphorically or "morally" rather than literally [1: p. 4].

Therefore, I think that in disputes about natural phenomena one must begin not with the authority of scriptural passages but with sensory experience and necessary demonstrations. For the Holy Scripture and nature derive equally from the Godhead, the former as the dictation of the Holy Spirit and the latter as the obedient executrix of God's order … God reveals Himself to us no less excellently in the effects of nature than in the sacred words of Scripture … and so it seems that a natural phenomena which is placed before our eyes by sensory experience or proved by necessary demonstrations should not be called into question, let alone condemned, on account of scriptural passages whose words appear to have a different meaning [7, p. 92].

Galileo's warning about the misuse of sacred scripture is particularly apt at this time when sincere but wrongheaded believers make statements about the age of the earth based on certain biblical texts. *The Bible* was written to reveal to human beings things which they otherwise might never know, about the facts of creation and salvation and the nature of the divine. *The Bible* was not written with the purpose of instructing us about the purely physical aspects of the universe, facts that as the Creator has arranged it, the human intellect is perfectly able to figure it out on its own.

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Quotes Cardinal Paul Poupard in a press conference at the Vatican, November 3, 2005. See also Associated Press account in *The Boston Globe*, November 4, 2005.
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Galileoâ€™s father had expected him to study medicine when Galileo entered the University of Pisa in 1581. Instead, Galileo became fascinated with mathematics and decided on a career in mathematical subjects and philosophy. He left the university without obtaining a degree. Yet Galileo showed his early genius by designing a new form of hydrostatic balance to measure small quantities. Galileo was an Italian scientist and scholar whose inventions included the telescope. His discoveries laid the foundation for modern physics and astronomy.Â Did You Know? Galileo supported the Copernican theory, which supports a sun-centered solar system. Did You Know? Galileo was accused twice of heresy by the church for his beliefs. He remained under house arrest the remaining years of his life. Did You Know? At Galileo we build specialist Talent Pools, utilising the markets top talent. Working with Galileo, you will be working with a true industry specialist Galileo's Core Markets. 1. Data & Business Intelligence 2. Online 3. IT Operations. Home.Â As a contractor I was first introduced to Galileo 4 years ago and I have held 3 subsequent contracts with them since. The team at Galileo are specialists in their fields and have the domain knowledge within their markets that I have not come across in any other recruitment firm. Careers. Regulation Research Analyst, New York, NY. Research, collect & analyze data on international financial regulation, capital markets, business & policy-making; generate reports for staff and clients.Â Send Resumes to: H.R., Galileo Global Advisors LLC, Ten Rockefeller Plaza, ste 1001, New York, NY 10020. Comments are closed. Careers Legal Notices Privacy Statement. 10 Rockefeller Plaza, Suite 1001 Phone: +1 212 332 6055 E-Mail: contact@galileoadvisors.com. Â© 2020 Galileo Global Advisors.