Hypothetical heresy: Faith and science as antagonistic worldviews

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A popular invocation of Galileo Galilei is often as the father and hero of modern science, an exemplar of truth and reason who was unjustly censured and arrested by the science-condemning Inquisitors of the Church, seeking wrongly to suppress the truth of Galileo's influential work. Galileo's advocacy of the Copernican heliocentric model of the universe directly clashed with the authority of scripture and its literal concurrence of a geocentric universe, leading to his Inquisitional conviction, and later recounted as the "Galileo affair."[i,1] Consequently, it is with the events that led to the Church's counteractions to those of Galileo's that serve as the historically interesting, and often overlooked, catalyst for the mythic Galileo. As such this imagery raises pertinent philosophical questions about dichotomies and discrepancies that divide faith and science as worldviews through which humans come to understand the nature of the universe and their places therein. These divisions necessitate two parallel modes of analysis, both of which are concerned with the role and contingency of 'time.' First, an assessment of faith and science as systems of thought during the "Galileo affair" needs to be developed. Second, the mechanistic nature of our world is understood as different, necessarily, according to the tenets of faith and the tenets of science; these also need to be developed. This is the case due to conceptual disparities of time and its relation to these respective worldviews – frameworks for devising, applying, and advancing knowledge. This calls for definitional assessment of how 'time' affects affirmations of worldview-defined truth-claims, and, ultimately, how this renders the coexistence of faith and science as incommensurable worldviews, distinctly different and separate from one another.

Because the "Galileo affair" serves as our historical case study, the following work will therefore be grounded in a particular historical methodology and interpretive philosophical reconstruction that will highlight the cleavage between post-Galilean science and the Christian faith, thereby demarcating between the two, as based on different conceptual understandings of time. Further, the following analysis of the "Galileo affair," as emblematic of the issues inherent in dialogue across faith and science divides, will be developed in the vein of a Kuhnian critique. Motivation for this approach rests on the fact that scientific revolutions come to represent not only the contemporary status of science, along with its practical and theoretical operations, but also the scientific revolutions and how their resultant paradigm shifts affect society far beyond the scientific realm, thus playing an integral role in how epochs are historically interpreted, defined, and reinterpreted. As such this is an inquiry concerning the epistemological differences that manifest faith and science as antagonistic worldviews. An expositional evaluation of these worldviews, beginning with the "Galileo affair," will help to flesh out inherent dichotomies between religious faith and the enterprise of science.

Galileo's work sought to show that through science humans could gain a working knowledge of the mechanistic underpinnings of nature by observing the world around them. Sensory experience and replicable demonstration here serve as the essential premises that engender the practice of scientific inquiry. Accordingly, Galileo reasoned that "the importance of necessary demonstrations … in conclusions about natural phenomena," carries empirical weight due to "sensory experience."[2] It was through conclusions arrived at by posing questions about the world and investigating through modes of observation that led Galileo to adopt Nicolaus Copernicus' heliocentric model of the universe, further supported by Galileo's own repeated telescopic observations and mathematical derivations (e.g., the discoveries of the phases of Venus and the moons of Jupiter). This outlook of sensory experience and replicable demonstration served as the criterion basis for the Scientific Revolution's application of methods of precise measurement and repeated observation, according to philosopher and historian Isaiah Berlin. "Consequently," Berlin says, "only the measurable aspects of reality were to be treated as real."[3] Regarding this historical outlook, Galileo's empirical approach to scientific discovery had the conceptual effect of bifurcating natural philosophy into two distinct, though still connected, disciplines: philosophy proper and modern science. Following this, the methodological shift from Aristotelian demonstrations from first principles, to experimental demonstrations as essential to scientific research, serves as Galileo's lasting contribution to modern science.

Galilean science was progressive: in advancing heliocentrism, Galileo's work, along with its promotion and defense, refuted the biblically consistent Ptolemaic cosmology of the universe. In so doing, his work necessitated an ideological retooling of theology and biblical hermeneutics, Aristotelian philosophy, and, most importantly, the methods and practices of scientific inquiry. In recalling Thomas Kuhn's philosophy of science outlined in *The Structure of Scientific Revolutions*, Galileo's advancement of Copernican heliocentrism represented the impetus toward a paradigm shift in Renaissance science and astronomy.[4] But because he was unable to convey the truth of heliocentrism beyond strong rhetoric and conjecture, which rested on his work inspiring scientists who were to follow, Galileo and the authority of science were censured by the religiopolitics of the Church, only to be fully and officially vindicated by the Holy Roman Catholic Church in 1992 by Pope John Paul II.[5] Here the words of philosopher Daniel Dennett are reminiscent of the "Galileo affair" awaiting the realization and confirmation (Newtonian dynamics) of its paradigmatic shift: "Again and again in science, yesterday's heresies have become today's new orthodoxies."[6]

But the "Galileo affair" was not simply the Church suppressing Galileo's voice of truth as heresy against scripture. Rather, the "affair" was sociopolitical in context with religious and judicial oversight because the institution of the Church saw Galileo as going against its authority – the arbiter of God's Word. Beyond his advancement of telescopic observations of the universe, which revolutionized astronomy in addition to his seminal work on physics, "Two New Sciences" (1638), which became fundamental to the later work of Sir Isaac Newton, Galileo's strong defense of Copernicanism in *Dialogue on the Two Chief Systems of the World* (1632) resulted in an epistemological crisis of faith when his understanding of science, along with his scientific proclamations, met the condemnation of the Inquisition.[2] Thus Galileo has come to serve as a martyr for science. And while he was in fact a devout Catholic who abjured for his transgressions against the Church, Galileo's convictions about the place and importance of science serves to show that, as modes of understanding our world, the

differences between faith and science embody divergent notions of authority. That is, Galileo's trial debates (1616 and 1633) over biblical hermeneutics – used to support a hypothetical heliocentric universe awaiting conclusive (Newtonian) confirmation – rendered the "affair" an ideological battle of the primacy of faith versus the primacy of science, insofar as both represent different sources of truth – hegemony. Consequently, the central issue in the trials against Galileo was the clash between opposing worldviews. This is the case because science and faith are not merely concerned with different notions of truth, but because the former is a continually changing, contemporarily-defined human pursuit of naturalistic knowledge; the latter being a constant metaphysics concerned with the supernatural, which is inherited through tradition and accepted on the basis of that tradition.

The question then becomes: What makes a scientific worldview different from attempts to understand the world through the lens of a faith-informed religious worldview? According to philosopher of science Peter Godfrey-Smith, "[s]cience is different because it is a process in which beliefs are shaped by observation. Ideas are assessed not in terms of their origins but in terms of how they stand up to testing."[7] It is through this process of observation that testing and subsequent results are assessed in a public forum. Results and public perception within the scientific community are what determine the contemporary reception of the authority of science. This is founded on the ideological principle that "[s]cience is open-minded … and flexible," says Godfrey-Smith.[7] Religion, on the other hand, is the manifestation of traditions and doctrines culminating in organized practices of beliefs with particular abiding worldviews and prescribed to its followers as authoritative and definitive. Regarding the truths about nature, the Christian worldview is concerned with ontological and theological particulars of how the universe is organized as ordained and overseen by a providential god of creation. Conversely, the enterprise of science constitutes a collection of general propositions concerning general truths about the nature of the universe and conducts itself according to a determinate set of guiding principles – scientific method in an open forum, thus allowing for replicability, verification, revolution, and normalization. Here particulars are essential only as instances of general principles. Resultantly, both religious faith and the enterprise of science purport truth-claims, though both arrive at their respective conclusions through vastly different presuppositions and procedures. And it is these presuppositions, procedures, and conclusions that define the particular worldviews though which humans come to understand nature, which simultaneously divide them from one another as congruent.

Because the Bible is not concerned with matters beyond spiritual salvation, it is therefore clearly not a book of science, and its readers should not circumvent real-world observations with conflicting appeals to biblical literalism. It was with this understanding that Galileo saw faith and science as serving separate functions to the human experience and therefore not in contention – ideologically – with one another. "Holy Scripture and nature derive equally from the Godhead," wrote Galileo, "the former as the dictation of the Holy Spirit and the latter as the most obedient executrix of God's orders."[2] This sentiment served to affirm and explain the notion of God as the author of two books through which human understanding derives: the book of nature (science, philosophy, and mathematics) and the book of scripture (the Word of God and its dissemination administered by the Church). It is with the book of nature that the realization and employment of human intellect and reason afford experiential conclusions about the world in which we live. The book of scripture is concerned with faith and salvation and therefore cannot serve to explain the natural disposition and mechanistic underpinnings of the world beyond its purported first principles of creation and its contingent eschatological end of history.

Galileo wrote that "[Natural] Philosophy is written in this all-encompassing book [of nature] that is constantly open before our eyes, that is the universe; but it cannot be understood unless one first learns to understand the language … in which it is written."[2] And according to Galileo that language was mathematics. It follows that science and philosophy, along with the metalanguage of mathematics, are all integral to the employment of intellect and reason as well as the overall human experience. "[S]o one must not … block the way of freedom of philosophizing about things of the world and of nature, as if they had all already been discovered and disclosed with certainty. Nor," Galileo continued, "should it be considered rash to be dissatisfied with opinions which are almost universally accepted; nor should people become indignant if in a dispute about natural phenomena someone disagrees with the opinion they favor."[2] Science informs us about nature and in turn that understanding helps us interpret the makeup and workings of ourselves, our world, and our universe. Accordingly, Kuhn says that scientific revolutions (i.e., paradigm shifts) cause scientists to see the world of their research differently.[4] It was with this type of understanding about the autonomy of human knowledge that Galileo met with opposition from the Church. Galileo truly believed that where religious dogma and articles of faith contradicted scientific conclusions, that it was the duty of the religious institution (i.e., theologians) to adjust itself and its scriptural interpretations to accord with experience and reason – scientific conclusions about nature – rather than to treat observational truth wrongly as religiously erroneous, biblically inconsistent, or outright heretical in character. Consequently, Galileo concluded that "[i]n disputes about natural phenomena, [scripture] should be reserved to the last place."[2]

The Church, though, did not recognize this Galilean division between faith and science and understandably so: potential backlash from the Protestant Reformation loomed, in terms of ideology and presumed individualism, which ultimately threatened the institutional authority of the Catholic Church. Additionally, notions that the Bible served the purpose of making sense of life as preparatory for the afterlife and that the task of "making sense" belonged strictly to Church theologians, stood as oppositional to Galileo's treatment of scripture. Consequently, very serious and frequent ways that interpreters and "expositors" (i.e., theologians) erred in reading and understanding scripture, says Galileo, are "to limit oneself always to the literal meaning of the words" and in turn use those words to define experiences in the natural world.[2] It is clear that the Church and Galileo had different understandings of scriptural interpretation, which therefore resulted in antithetical emphases regarding the place and importance of science. It follows, then, that Galileo was censured and arrested, not because he affirmed the Copernican heliocentric model of the universe, but because he supported that hypothesis with reinterpreted scriptural passages.[ii,8]

As an ideological debate, the "affair" shows inherited faith to be an unsubstantiated (beyond tradition) truth compared to the observational (experiential reality) truth that informs scientific theory, with both being interpreted in temporal contexts, though resulting in varying norms and values. The effect was not in Galileo's time, nor is it now, simply a difference in starting places and motives for the projections and progressions of faith (accepted finality) and science (methodological approach to know the not-yet-known). But more importantly, faith and science serve as different modes of interpreting and understanding the world and human experience. Consequently, the presuppositions and purposes of faith and of science become confounded by different conceptions of time and how time relates to notions of progress. It is the co-evolution of these worldviews

that prove them to be incommensurable pursuits of truth and ways of understanding such truths in time. As a result, the very different institutional evolution of faith from that of science is the result of a biblically-based conception of time in the Christian worldview: time, here linearly defined, manifests as a belief concerned with a purposeful beginning and end – creation and eschaton. Between the beginning and the end is temporal reality in time. But in the Christian worldview, as noted in Revelations 21-2, this is a time of waiting, a transitional period between the Christ's resurrection and his return and reconstitution of creation. But this locates time as contained and constrained within a beginning and an end, further confounded by a Christian teleology. This transitional period sees the propagation of believers perpetuate end-goals of happiness in the now by looking to an eternal, more important life in the ever-after. In this schema human progress is easily and often interpreted as developmentally linear, or progressing toward a determined, exponential end – premillennial in nature.

An understanding of time as a linear progression of developmental progress proves difficult when one attempts to understand natural phenomena within it (i.e., within time). The typological Christian understanding of linear time mentioned above can be quite dangerous, according to Isaiah Berlin, and in line with Kuhn, because "[scientific] problems change from one age to another, representing no straight line of progress … as human thought and language change under the impact of the factors which determine the forms and the concepts in which men think, feel, [and] communicate."[3] What is more, mythologist Joseph Campbell posits that "philosophically it is not permissible to speak of a 'time' when time was not or when time will cease to be. There is no before and after time that is not itself time."[9] And when biblically-based understandings of time or notions of God-ordained human progress enter the scientific arena, the result has historically been one of science being subordinated to a metaphysical supremacy that is informed and defined by an authoritarian faith, not bound by time – thus science regarded by the Church as the "handmaiden" of theology.[iii,10]

Kuhn asserts "the tendency to [recognize] the development of science [as] linear hides a process that lies at the heart of the most significant episodes of scientific development."[4] This "process" being what he refers to as problems and revolutions in science that result in paradigm shifts – significant changes or discoveries that so greatly affect understandings of the world that conceptual reversions to preparadigmatic changes are impossible and that dialogue between paradigms is also impossible. This is what Kuhn regards as the "incommensurability" between paradigms. Subsequently, Kuhn recognized that Galileo's work served to advance science while simultaneously awaiting the conclusive evidence to confirm the heliocentric hypothesis. He says of Galileo that "[h]is example typifies one important aspect of theoretical genius in the natural sciences – it is a genius that leaps ahead of the facts, leaving the rather different talent of the experimentalist and instrumentalist to catch up. In this case catching up took a long time."[11]

Galileo's advancement of heliocentrism called the geocentric position into question by way of logically sound, though temporally inconclusive, refutation. But the Church could not accept a scripturally supported hypothesis that did not directly cohere with said scripture, interpreted literally. Acceptance of truth had to wait until Newton's mathematical confirmation of the legitimacy of heliocentrism, which made returning to geocentric understandings of the universe counterproductive to science, thus confirming the Galilean paradigmatic shift and normalizing heliocentrism as the basis for modern astronomy. This was the case because "[a]fter a scientific revolution many old measurements and manipulations become irrelevant and are replaced by others instead," asserts Kuhn.[4] It follows that science is in a continual process of change. Such changes, though, are not fully recognized until new understandings and conclusions about the constitution of our world, new theoretical developments, and new methodological approaches impart and advance revolutionary knowledge, thus becoming what Kuhn calls "normal science." In line with this analysis, Galileo penned a similar proclamation concerning the state of contemporary science: the results of scientific investigations drive the "necessity of changing the previous conception of the constitution of the world."[2] As a result, scientific inquiry becomes a pursuit of knowledge that is located contemporarily, hence epoch-defining. In comparison, inherited faith represents a constant metaphysics that is accepted on the basis of belief, which only changes insofar as is necessary to contend as a venerable worldview in a scientifically informed and evolving world.

Galileo often affirmed the law of noncontradiction throughout his writings, referring to his understanding of the truth-claims of faith and those of science as parallel.[2] But historian Vern Bullough raises pertinent questions about these assumed parallel truth-claims that highlight the cleavage between faith and science across time: "How does one incorporate … new [scientific] discoveries into theological thinking? Should they be incorporated? Should religious belief be based on science?"[12] Or are they different realms, different ways of understanding the world and understanding life? Bullough qualifies these questions by suggesting that religious faith and the enterprise of science represent two different "magisteria." His employment here of "magisteria" denotes the realms of faith and science as distinct worldviews with different kinds of truths, different understandings of the world, different notions and values pertaining to the concept of time. It is immediately evident that Galileo's philosophical ideal of two truths recalls the problems inherent in authority and hierarchy while also embodying issues of contingency and temporality. Can the truths in question – scientific observations about nature and references and teachings about nature in scripture – both claim to represent truth as such? That is, granting Galileo's proclamation, are we to regard science (as a human endeavor) at the theoretical level with the Christian faith, or any faith for that matter (as belief in the otherworldly), as the overarching metatheory? It seems that while these two "magisteria" can more or less cohabitate, they cannot cooperate while simultaneously remaining autonomous because one worldview would necessarily be required to subordinate or defer to the other, thereby satisfying Galileo's misguided appeal to the law of noncontradiction.

A contemporary analysis of Galileo's harmonization of faith and science shows that even though science is definitionally afforded a certain autonomy – science being the discipline through which philosophical inquiries pertaining to the constitution of our world and its place in the universe can contemporarily be observationally and satisfactorily conducted – as a human endeavor, science would necessarily fall under the purview of the primacy and finality of religious faith. The result – which, to be sure, was not Galileo's analytical aim – manifests in the form of metaphysical apologetics: if faith and God above are recognized as truth on the basis of their authoritative truth-claims, then science's autonomy is merely a guise for religion's first principles and final causality, according to articles of faith of the Christian tradition. The issue here is hegemonic preeminence. And whether it is faith as such or religiopolitical authority, which itself is a human institution, in Galileo's time, as in ours, religious faith presumes to lay claim and preside over and above all human endeavors as 'Ultimate Truth.' The "Galileo affair," then, exemplifies how faith's truth-claims can become politicized and used wrongly to judge scientific matters,

fallaciously disregarding the epistemic differences that separate scientific knowledge from theological knowledge. This presumed religious oversight serves as counterproductive to both religion and science and shows the Church to have disregarded Galileo's warning that, in so doing, "we would deny our senses and reason," as well as human intellect, experience, and demonstrations of "physical conclusions."[2] Religious scholar Michael Horace Barnes authoritatively concludes that "[r]eligious thinkers do not serve humankind well by undercutting the method of science…[because] undercutting the best means available for judging the validity and reliability of truth-claims will hurt people in general, including those in communities of religious believers."[13]

Faith and science thus represent incommensurable ways of viewing the world and deriving intelligible knowledge about the world. Because religious faith requires the inclination to accept the very authority that promises its truth, the criterion for belief creates a tautological circularity that proves immensely difficult for dialogue across scientific (empirical) and religious (faith) divides. "[T]he status of the circular argument," according to Kuhn, "is only that of persuasion. It cannot be made logically or even probabilistically compelling for those who refuse to step into the circle."[4] Consequently, when religion and politics become conflated, all aspects of life are thus affected due to a presumed God-ordained hegemony, thereby requiring worldly 'truths' to cohere with an unsubstantiated 'Ultimate Truth.' Resultant religious authority manifestly operates as "monolithic, centralized, esoteric, resistant to change, and self-protective," says philosopher Richard Blackwell. "By contrast," Blackwell continues, "authority in science … is pluralistic, democratic, public, fallibilistic, and self-corrective."[14]

The Church's loss of societal influence from once-dominant political authority – including in matters where religion had no place (e.g., the "Galileo affair," or, more broadly, the enterprise of science) – to a lower level of societal influence corresponded with the rise of importance and power of science in modern society. As a result, the Church has assumed a reactionary and defensive position toward the scientific community's increased legitimacy. This is the case because faith is an emotive belief that cannot explain natural phenomena beyond purported first principles and can neither be proved nor disproved by science. But, this does not comport with what we can see and what we can know as derived from experiential fact. By extension, Christianity and other religions are pseudo-theoretically tenable but are not themselves 'theories' because they lack falsifiability and operate outside of logical parameters. Therefore, to ascertain a coherent understanding about the intricate workings of nature, one ought to look to the enterprise of science. It follows that modern science, in keeping with Galileo's criterion of method and observation, clearly falls outside religion's presumed jurisdiction over all human endeavors and is therefore not subject to accord with or to subordinate to articles of faith. Conversely, in recalling an important Galilean theological distinction, resultant discrepancies between scientific conclusions and religious conjecture necessitate reconciliation on the side of faith, albeit an apologetic effort, due to the fact that inherited Christian understandings of time, creation, and eschaton must be made consistent with observations and facts.

To conclude, not only does science change, but also human understanding changes along with it, and the methods of science represent the best means of explaining natural phenomena and the mechanistic disposition of the world and its place in the universe. Therefore, the continued significance of the "Galileo affair" serves to exemplify the necessity and importance of intellectually differentiating between religious faith and the enterprise of science, for the relationship between religion and science and science and religion is asymmetrical. Thus, these two worldviews have been shown to be incommensurable.

Notes

[i]While not the first scholar to employ the umbrella term, the "Galileo affair," Maurice Finocchiaro's analysis and reconstruction of the "affair" serves as foundational to understanding the contextual developments which began in 1613 and ended with the Inquisitional trial against and condemnation of Galileo Galilei in 1633.

[ii]Nineteenth century historian of science Andrew Dickson White reasoned his way to the same conclusion, saying, "Galileo was condemned, not because he affirmed the motion of the earth, but because he supported it from Scripture."

[iii]The metaphoric image of science as the "handmaiden" of the Church is an illustrative extension of the Medieval understanding of theology as the "Queen of all Sciences" and is developed in detail by David Lindberg.

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