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WHY PROTESTANT CHRISTIANITY NEEDS A THEOLOGY OF NATURAL LAW

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Natural law is an idea of perennial importance and controversy in the Western world, and now in other places too. This idea didn't die in twentieth-century Protestant thought, but it fell on hard times. During the opening decades of the twenty-first century, interest in natural law has suddenly sprung to life again in many Protestant circles. This is an encouraging development—from historical, philosophical, and theological perspective. But it remains controversial. In this article, I don't offer a detailed *theory* of natural law. I simply wish to make a biblical and theological case that Protestants need some account of natural law if they are to make sense of many of their fundamental convictions as heirs of Reformation Christianity.

PROTESTANTS NEED SOME ACCOUNT OF NATURAL LAW IF THEY ARE TO MAKE SENSE OF MANY OF THEIR FUNDAMENTAL CONVICTIONS AS HEIRS OF REFORMATION CHRISTIANITY.

It is appropriate to begin with a brief comment on what I mean by *natural law*. In very general terms, natural law is a universally obligatory morality that all people know, or at least can know, simply by being human and living in the kind of world they do. But as a Christian, I want to say more than just this. Natural law, more specifically, is an aspect of God's natural revelation by which He makes known His basic moral law to all people, not through Scripture but through the world He has made. To be clear, by "natural law" I don't mean people's *theories about* natural law, but the law itself that God reveals through His creation and which thus exists independently of anybody's theory. People's theories about natural law are subjective and fallible, and thus always open to debate; God's natural law is objective and true.

Many people think there is no natural law, and some even find the idea ridiculous. These skeptics have some initially plausible reasons. As they point out, people in different cultures do things differently. There is no universal morality to which all subscribe, at least when we move beyond generalities and examine details. The skeptics also pose some good questions to proponents of natural law: How can understanding the nature of the world really demonstrate how people ought to live? How can someone prove what the natural law is, even if it does exist? When people talk about "natural law," aren't they really just reading into nature what they already believe for other reasons and then trying to impose their views on others?

Those aren't the easiest questions to answer, and it's not difficult to understand how people can get comfortable with such a skeptical attitude and thus dismiss natural law as an antiquated idea. But as soon as they do, it seems that events arise that force them to reconsider natural law. The Nuremburg trials following World War II offer a good example. Western jurisprudence of the early twentieth century had been quite positivist in character and wary of the notion that civil law

1. This essay is based on a lecture at the Davenant Institute's Denver Regional *Convivium Irenicum* at Colorado Christian University, in March 2018. I presented a similar lecture at Grove City College in November 2016. For a more detailed and scholarly discussion of the same issues, see my "Natural Law for Reformed Theology: A Proposal for Contemporary Reappropriation," *Journal of Reformed Theology* 9 (2015): 117-30.

is properly grounded in natural law. But then what to do with Nazi officials who had perpetrated atrocities but had done so under the cover of German law and established authority structures? If positive law is the only kind of law, there was no evident basis on which to hold them accountable. All at once, the power and attractiveness of the idea of natural law were evident for all to see.

The notion of human rights, now so prevalent in political discourse, also shows the attractiveness of natural law. For human-rights discourse to make much sense, it needs the ability to make moral judgments across cultures. It needs to claim with conviction that there are certain things that one just should and should not do to other human beings. To say such things is to speak as if there's a natural law.

After an extended period of widespread denial, scholars have come to recognize that Reformed theology (and other Protestant theologies) widely affirmed the idea of natural law in their early centuries. But influential voices are still wondering whether natural law deserves a place in contemporary Protestant thought. Does recognizing the importance of natural law compromise the importance of the Bible, they ask, and does it underestimate the effect of sin? In the remainder of this essay, I suggest three important reasons why Protestants need a conception of natural law. As I hope to show, they need one not *in spite of* their doctrines of Scripture and sin, but in order to do justice to these doctrines.

PHOTO OF THE TRIAL AT NUREMBERG, DEPICTING THE DEFENDANTS, GUARDED BY AMERICAN MILITARY POLICE

AN OBJECTIVELY MEANINGFUL NATURAL ORDER

The first reason Protestants need a conception of natural law is that it enables them to have a coherent and powerful way of affirming that this world is objectively meaningful and purposeful, and that human beings are equipped to discover this meaning and purpose. To put it another way, affirming natural law is to affirm that God made this universe in such a way that there's a morally appropriate manner for human beings to live within it, and that the moral law revealed in Scripture isn't arbitrary, but reflects this created reality.

To appreciate this claim, a brief and very simplified description of our historical context may be helpful. In what we sometimes call the *pre-modern* period, Western culture widely affirmed that the world has objective meaning. Furthermore, this objective meaning was thought to be intelligible to human beings; that is to say, human beings are the kinds of creatures able to perceive and understand the meaning of the world. In this paradigm, truth is primarily something to be discovered, not created. In the so-called *modern* period, however, focus shifted from the objective world to the subjective human knower. Reason was no longer primarily an instrument for discovering truth in the world but the means for imposing truth upon the world. The world has meaning, in other words, insofar as human beings project meaning onto it. But since moderns believed that all humans shared the same rationality, they thought that as long as they used their rational powers properly, they would all project the same meaning onto the world. Now, in our *postmodern* world, people not only reject the objective meaningfulness of the world but also question whether reason is universal. For postmoderns, then, each person (or community) imposes its own distinctive meaning onto the world and there are no established criteria for judging whose meaning is better. People are left to construct their own stories and own theories, and each one has his or her own "truth."

What are Christians to make of this? While they should not identify Christianity with pre-modernism generally, Christians have good reason to affirm the pre-modern belief that the world has objective meaning and is intelligible to human beings. Truth is something to be discovered, not constructed. The idea of natural law is bound up with this conviction: given what we humans are by nature, and given the nature of the world around us, there are appropriate ways for us to live within it. We can't simply choose to be whatever we want. We *are* creatures of a certain kind, and this has moral implications.

This is evident already in the early chapters of Genesis. One of the obvious things we see in Genesis 1 is that God created the world, and in doing so He made it with inherent meaning and purpose. God separated one inanimate thing from another—day from night, and water from dry land. God also made animate things according to their kinds—fish, birds, and land animals. He also created human beings, not according to their own kind but in His own image and likeness. In each case, God gave things their own distinct nature. Furthermore, God made each thing with a task to perform that corresponded to its nature. God made the heavenly expanse, and by virtue of being an expanse it was to separate waters from waters (1:7). He made the two great heavenly lights, and by being great heavenly lights they were to rule over day and night and to separate light from darkness (1:16-18). When God created human beings, He made them to rule over other creatures (1:26). This makes perfect sense: as God exercised supreme rule over the world in creating it, so those bearing His likeness were fit to rule in the world under Him. Nothing was arbitrary. Each creature's commission matched its nature. Each one had meaning and purpose within God's grand design. And despite the devastation of the fall into sin (3) and the great flood (6-7), Genesis 8-9 narrates God's reestablishment of meaning and purpose in the world. He promises regularity in the cycles of nature (8:22), describes boundaries between humans and beasts (9:2), and affirms that humans remain His image-bearers, with the moral task of ruling in the world by enforcing justice against the violent (9:6).

One of the ways this plays out later in Scripture is in the Old Testament prophets' treatment of sin. They don't simply condemn sin as the breaking of an arbitrary divine rule, but as something bizarre, nonsensical, and out of accord with the way things are. Sin flips the order of reality. Consider Amos 6:12: "Do horses run on rocks? Does one plow there with oxen? But you have turned justice into poison and the fruit of righteousness into wormwood." For Amos, sin is ridiculous. Isaiah also speaks of sin as scrambling the order of nature: "The ox knows its owner, and the donkey its master's crib, but Israel does not know, my people do not understand" (1:3). "Shall the axe boast over him who hews with it, or the saw magnify itself against him who wields it" (10:15)? "Ah, you who hide deep from the Lord your counsel, whose deeds are in the dark, and who say, 'Who sees us? Who knows us?' You turn things upside down! Shall the potter be regarded as the clay, that the thing made should say of its maker, 'He did not make me;' or the thing formed say of him who formed it, 'He has no understanding'" (29:15-16). As these prophets saw it, sin contravenes the nature of things.

PERSONIFICATION OF WISDOM (SOPHÍA) AT THE CELSUS LIBRARY IN EPHESUS (2ND CENTURY)

On a more positive note, the objective meaningfulness and purpose of the world is also crucial for understanding Scripture's treatment of *wisdom*. Just as sin is not simply the breaking of an arbitrary divine rule, but contravening the order of reality, so righteousness is not simply following divine rules, but also living in fruitful and productive ways that fit the world we know. This theme is especially prominent in Proverbs. Living wisely entails a perception of how the world works and how certain kinds of behavior tend to bring harm and other kinds tend to bring blessing. Wise people gain moral insight not by memorizing long lists of rules but through experience, observation, and reflection on life as it transpires around them. Proverbs presumes the existence of a natural moral order that human beings can and ought to understand.

In short, the idea that God has made the world with objective meaning and purpose is a long-standing Christian conviction and an important part of biblical teaching. Human beings themselves have objective, God-given meaning and purpose, rooted in their nature as divine image-bearers. The path God calls human beings to walk isn't arbitrary or detached from their nature, but corresponds to the way He made them and the broader world. Without some theology of natural law, it is difficult to see how Protestant Christianity can affirm this consistently.

UNIVERSAL ACCOUNTABILITY BEFORE GOD'S JUDGMENT

The second reason Protestants need a theology of natural law is to enable them to affirm and explain the accountability of all human beings before the just judgment of God. The doctrine of a final judgment is standard fare in classical Protestant theology and in other Christian traditions. A conception of natural law is necessary for explaining how God is just in executing this judgment.

Before considering the reasons for this claim, it may be interesting to reflect on what human beings instinctively think of the notion of a final judgment before the throne of God. There's something about the doctrine that's inherently terrifying. The idea that an all-knowing and perfectly holy judge would examine every thought of one's mind and every passion of one's heart over an entire lifetime is enough to alarm the most God-fearing person. Yet there's also something about the doctrine that's profoundly encouraging and deeply satisfying. It promises that God will set all things right on the final day. In the midst of a broken world filled with intractable injustice, that's an attractive prospect. Another way to think about this latter point is that sinful human beings still display a remarkable longing for justice. And insofar as they do, they often have to admit that justice simply cannot be done in particular circumstances, given the constraints of this present world. One can sometimes hear this insight emerge after terrible events such as acts of terrorism. Even if the perpetrators can be apprehended, people lament, there's no way to achieve true justice. No punishment is proportionate to the crime and there's no way to restore lost limbs and lives to victims. Such situations bring home the realization that if all things are going to be made right, it will have to happen by a supernatural act of divine power.

However sobering the thought of a final judgment may be, Christians confess that it is coming. Scripture not only describes this great day many times but also declares repeatedly that God hates injustice and will bring righteousness to the world. He will right every wrong and hold all evildoers accountable.

This presents another reason why Protestants need a theology of natural law: if God is to administer the final judgment justly, He must hold people accountable for what they know. A just judge should not convict people of deeds they don't know are wrong, for which they can honestly plead ignorance. A just judge cannot bring charges based on a law that was never promulgated to those in the dock. Thus, we wonder: on what basis will God judge the nations of the world? Protestants might naturally appeal to the divine law revealed in Scripture. God will undoubtedly hold people responsible for breaking this law if they have heard or read it, but a great many people have never been exposed to the Bible. On what basis will God judge them? The existence of a natural law that all people know provides an obvious answer—and it's also Scripture's answer.

In the Old Testament, an interesting place to begin exploring God's universal judgment is the prophetic oracles against Gentile nations. The prophets ordinarily preach to Israel, but all of the major prophets and some of the minor prophets also include prophecies directed toward Israel's pagan neighbors. Some of these foretell future blessings of salvation, but many are declarations of judgment for their wickedness. Given the issue before us, we wonder on what basis God judges them. When the prophets condemn Israel, they regularly cite its disobedience to the Mosaic law given at Sinai. But the oracles against foreign nations never bring such accusations. The Gentiles didn't stand before Sinai, and they are not bound by its law. Yet God treats them as morally responsible people who know the difference between good and evil and are accountable for their actions. The opening of Amos offers a good example. Amos begins with six short oracles against Gentile peoples (1:2-2:3) before proceeding to judgments against Judah (2:4-5) and Israel (2:6-16 and following). Only when reaching Judah does Amos accuse the people of rejecting "the law of the LORD" and not keeping "his statutes" (2:4). When he condemns the Gentiles, he doesn't cite obscure things or matters for which they could claim ignorance, but cites what we might call atrocities or crimes against humanity. They have engaged in slave-trading (1:6), violated treaties (1:9), ripped open pregnant women (1:13), and desecrated dead bodies (2:1). Amos never uses the terminology of "natural law," but he presumes that all people know that such conduct is reprehensible and deserves punishment.

ABIMELECH REBUKING ABRAHAM, WENCESLAUS HOLLAR (1607–1677)

From a different angle, a striking incident earlier in the Old Testament also testifies to the universal knowledge of right and wrong. Genesis 20 narrates Abraham's sojourn in the region of Gerar. Concerned that its inhabitants would kill him in order to get his wife Sarah, Abraham tells them that she's his sister. Abimelech, king of Gerar, proceeds to take Sarah into his house. Warned in a dream that Sarah is really Abraham's wife, Abimelech calls Abraham into court the next morning and brings charges against him: "What have you done to us? And how have I sinned against you, that you have brought on me and my kingdom a great sin? You have done to me things that ought not to be done" (20:9). This is a remarkable turn of events. The Gentile Abimelech accuses Abraham, God's covenant partner, of doing what ought not to be done. Abimelech needed special revelation to learn that Sarah was Abraham's wife, but he didn't need to be told that that passing off one's wife as one's sister is morally abhorrent. Abimelech says, in effect, that there are some things human beings just should not do to one another, no matter where they live or what people they're from. Abraham had done something that *everyone* knows is wrong.

The New Testament confirms the Old Testament evidence of a universal judgment of God based on a universal knowledge of right and wrong. In fact, the biblical texts most famously associated with natural law, in Romans 1 and 2, clarify the Old Testament evidence by teaching that this universal knowledge comes by "revelation" and takes the form of "law."

Paul begins by saying that God's wrath is being revealed against "men"—not against Jews in particular, but against all people—who suppress the truth in unrighteousness (1:18). How can this be, we wonder, since Gentiles never received God's law at Sinai? Paul explains, "What can be known about God is plain to them, because God has shown it to them. For his invisible attributes, namely, his eternal power and divine nature, have been clearly perceived, ever since the creation of the world, in the things that have been made. So they are without excuse" (1:19-20). That is, God holds all people morally accountable because He's made Himself known in the natural created order. Thus, all people in fact *know* God, although they don't honor Him (1:21). Paul proceeds to list a host of sins that people fall into (1:22-31) and then declares that they "know God's decree that those who practice such things deserve to die" (1:32). By virtue of natural revelation, all people know both their basic moral responsibilities before God and that they deserve judgment if they violate them.

Shortly thereafter, Paul confirms the basic principle of justice mentioned at the beginning of this section, that a just judge won't accuse people on the basis of a law that doesn't bind them. He writes, "All who have sinned without the [Mosaic] law will also perish without the law, and all who have sinned under the law will be judged by the law" (2:12). Simple and straightforward. But then Paul states, "For it is not the hearers of the law who are righteous before God, but the doers of the law who will be justified" (2:13). This complicates matters. If one has to be a "doer" of the (Mosaic) law in order to be justified, what becomes of the principle that God won't judge people on the basis of a law they don't know? Paul answers exactly this question by pointing to the natural law, "For when Gentiles, who do not have the [Mosaic] law, by nature do what the law requires, they are a law to themselves, even though they do not have the law. They show that the work of the law is written on their hearts, while their conscience also bears witness, and their conflicting thoughts accuse or even excuse them on that day when, according to my gospel, God judges the secrets of men by Christ Jesus" (2:14-16). Paul's point is that a Gentile who performs (or violates) the requirements of the natural law is in the same position before God's judgment as the Jew who performs (or violates) the requirements of the Mosaic law.

Thus, Romans explains in a more precise way what the Old Testament describes narratively. God holds all people accountable before His judgment, whether they've heard the Scriptures or not. And He judges justly even those who haven't, because He judges them on the basis of the universal natural law which they know, by virtue of being human and living in this world.

FOUNDATION FOR THE GOSPEL

The final point really gets to the heart of things: Protestant Christianity needs a theology of natural law in order to understand the gospel and to communicate it to the world. In short, natural law makes the gospel coherent. Since there was nothing more central to the Reformation than recovering and proclaiming the good news of salvation, natural law's connection to the gospel is crucial to consider.

NATURAL LAW MAKES THE GOSPEL COHERENT. SINCE THERE WAS NOTHING MORE CENTRAL TO THE REFORMATION THAN RECOVERING AND PROCLAIMING THE GOOD NEWS OF SALVATION, NATURAL LAW'S CONNECTION TO THE GOSPEL IS CRUCIAL TO CONSIDER.

We've just reflected on God's universal judgment and how natural law explains God's justice in executing it. That is all very important. But the fact is that *all* of us are sinners, and even the best of us, if we stood before the final judgment on our own with only our own works to show for ourselves, would be in deep trouble. Whatever satisfaction we might enjoy from seeing other wicked people get their comeuppance would be more than muted by the prospect of getting what we ourselves deserve too. As the Reformers passionately proclaimed, we need not only the law but also the gospel, which announces salvation from the judgment of the law through the death and resurrection of Jesus Christ, received by faith alone.

For the Reformers, famously, the "law" describes what God requires from us and the "gospel" describes what God does for us in Christ. But without the law, the gospel makes no sense. The gospel doesn't come to people who are blank slates, but presumes that they know a lot of things. It presumes they know that there's a God, that they're accountable to Him, that He demands particular things, and that they've violated these demands and thus stand guilty before Him. In other words, the gospel presupposes knowledge of the law. The law has a certain priority to the gospel. A person can know the law without knowing the gospel, but no one can understand the gospel without understanding the law first.

Yet the gospel depends on the natural law and not just on the law revealed in Scripture, for the church proclaims the gospel as good news to *all* people, and not simply to Jews trained under Moses. It's useful to return to Romans at this point. The basic movement of the first half of Romans is not difficult to see, despite the occasional objection. After a greeting and introduction, Paul levels an indictment against the entire human race (1:18-3:20) and then explains the good news of salvation in Christ (3:21-8:39). In Reformation terms, the first focuses on the law and the second on the gospel. In the indictment, natural law plays a crucial role. As considered above, Paul appeals to the natural revelation of God and His will to establish Gentile humanity's knowledge of sin and God's justice in the coming judgment. Of course, Paul also ascribes a similar task to the Mosaic law with respect to Jews. But it's important to recognize that if *only* the Mosaic law provides knowledge of God and sin, the gospel would make sense only to Jews. Because Paul was the apostle to the Gentiles (Rom 1:1; 15:16), he makes clear that the gospel is for everyone. For those without training in the Old Testament law, the natural law provides the knowledge of sin and judgment that makes the gospel coherent.

The natural law itself doesn't reveal the good news of salvation. There's a natural *law*, but there's no natural *gospel*. A conception of natural law does, however, provide theological explanation for why the Son of God became incarnate, died, and rose again. The church doesn't preach the gospel into a vacuum, but to real people whom God created for good purposes and who failed to attain those purposes. It preaches to people who are hurt and needy—hurt and needy not because they're lost in a sea of chaos, but because they're out of alignment with the moral order by which God governs this world. Natural law explains the biblical teaching that, deep down, all people know that there's a God, a moral order of the world, and a final judgment. Thanks to the natural law, every person is ready, at some level, to hear and to understand the gospel, even before any Christian explains it to him. If Protestants eliminate natural law from their theology, they deprive the gospel of the scaffold on which it takes shape.

CONCLUSION

Readers who are orthodox Protestant Christians—heirs of the Reformation—probably already believe that there's a natural law, whether they realize it or not. That's because such readers believe that the world God created has objective meaning and purpose, that God will judge the whole world justly on the last day, and that the gospel of Jesus Christ ought to be proclaimed to all people, who are ready to hear it because they know they are sinners alienated from God. To affirm these things is to affirm, at least implicitly, that God reveals His universal moral law in the natural order, as this article has argued. But if that's the case, then recognizing and acknowledging the reality of natural law explicitly should help Protestants make more sense of the Christian faith and of the world in which they live. The renaissance of interest in natural law in many Protestant circles in recent years is thus encouraging, even if much work remains to be done.

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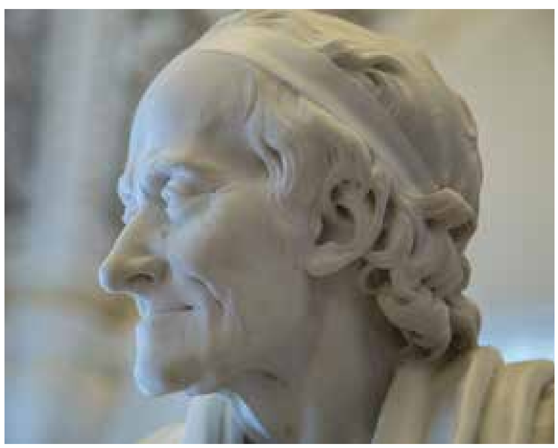
THE WAR WITH NO SIDES: ANOTHER LOOK AT THE USE OF SCRIPTURE AND SCIENCE IN THE REFORMATION DEBATES ABOUT COPERNICUS AND GALILEO | DERRICK PETERSON

History is always about the particular and the human, and the particular and the human are always messy. —Dom Paschal Scotti, *Galileo Revisited*[1]

“I believe, because it is absurd”—the most famous statement that Tertullian never said.[2] Modified by 17th century Englishman Thomas Browne, and then transmuted again into its familiar form by Voltaire, the *credo* is an invention of the Enlightenment.[3] Sadly, it also embodies what is today a fairly standard opinion regarding the history of ’s relationship to the sciences. But what has been the actual relationship between Scripture, theology, and our knowledge of nature in natural philosophy (and today, the sciences)? What should it be? These questions are daunting for any number of reasons, including the internal diversity of Scripture, theology, and the sciences themselves. As Mikael Stenmark reminds us in his work updating and revising Ian Barbour’s famous science and religion typologies,[4] asking about “the” relationship is already to miss out on the fact that such relations will look different depending upon, for example, what sub-disciplines one is attempting to coordinate, or at what point one’s research is at. Looking at Christology and anthropology, for example, will trigger different relationships than theology proper and cosmology, which yet again will no doubt be different if one is analyzing these questions in terms of epistemology, metaphysics, or trying for an ultimate synthesis in systematic theology.



STATUE OF VOLTAIRE

One way to try and tackle these complexities is to narrow down the question from such great heights as “science” and “religion,” to engage in case studies that zoom into particular historical episodes involving Scripture and theology in specific contexts. Though it will be complicated enough on its own, in this essay we shall look briefly at how Scripture was used in the Reformation debates about Copernicus’ theory of heliocentrism, and in the Galileo affair. There was no single mode or manner in which Scripture was brought to bear upon the topic of heliocentrism, and we should be exceedingly cautious about using broad categories like “religion” and “science” when attempting to describe this often misunderstood episode of history, for they hardly represent to us what occurred. It is also very unlikely that the historical actors themselves would have recognized these categories as their own.

MATTERS OF HISTORIOGRAPHY

Before we dive in, we do well to note that a major factor for complexity in understanding historical episodes like the Galileo affair come from how many figures have been represented and handed down to us historically. Though Galileo’s life and trial have gone through an innumerable succession of interpretations and reception as Maurice Finocchiaro masterfully details,[5] positivist and physicist Ernst Mach wrote one of the first histories of mechanics that set the tone for subsequent works by separating Galileo out as the singular initiator of the new science.[6] “The main effect of Mach’s book in the various editions

1. Dom Paschal Scotti, *Galileo Revisited: The Galileo Affair in Context* (San Francisco: Ignatius Press, 2017), 12.

2. Eric Osborn, *Tertullian: First Theologian of the West* (Cambridge: Cambridge University Press, 2003), 28: “[These claims about Tertullian’s *credo*] have become a slogans in fideist alternatives to the Enlightenment where they have … Acquired a meaning which is foreign to Tertullian. Not only did he never say ‘credo quia absurdum,’ but he never meant anything like it.”

3. The hilarious and fascinating tale of this apothegm is traced by Peter Harrison, “‘I Believe Because It Is Absurd’: The Enlightenment Invention of Tertullian’s *Credo*,” *Church History* vol. 86 (2017): 339-364.

4. Mikael Stenmark, *How to Relate Science and Religion: A Multidimensional Model* (Grand Rapids: Eerdman’s Publishing, 2004).

5. Maurice A. Finocchiaro, *Retrying Galileo 1633-1992* (California: University of California Press, 2007).

6. Ernst Mach, *The Science of Mechanics: A Critical and Historical Account of Its Development*, trans. Thomas J. McCormack, 6th ed. (Lasalle, IL: Open Court, 1960), esp. 39-45.

it went through between 1883 and 1912," writes historian of science H. Floris Cohen, "was that it pinpointed Galileo as the central figure in the birth of modern physics."[7]

> What was new about Mach's book was that it purported to discuss the entire science of mechanics from a historical point of view … Galileo was now, in a seemingly well-documented manner, made the central focus of the first stage of the new physics.[8]

The way Mach presented Galileo severed him from his scholastic and Jesuit sources,[9] his theological commitments[10] and metaphysical background,[11] as well as underplaying the developments and contributions of the church in the areas of astronomical observation and mathematics in particular.[12] This framing of Galileo deeply exaggerated the already stilted opinions regarding his rift with the Church. Major portions of these oversights were undone by the gargantuan work of Pierre Duhem,[13] though unfortunately despite being friends with Duhem and deeply admiring his work, Mach never revised his opinions regarding the sterility of the Christian Middle-Ages or of Galileo's uniquely modern genius.

Mach's "positivist" view of history, and not Duhem's, ended up dominating through the mid-twentieth century.[14] Several years ago the philosopher and historian Dudley Shapere collected a large number of physics textbook accounts of Galileo that were, in their essence, *still* little more than a repetition of Mach's trimmed-down caricature of Galileo shorn of his greater intellectual, practical, and social contexts.[15] Especially in the wake of Duhem's research, "It is interesting to follow Mach through successive editions of his book [*The Science of Mechanics*]," writes Shapere, "as he tries to come to grips with that new information [of the medieval precedents for Da Vinci and Galileo] while at the same time maintaining substantially his original view."[16] Indeed, many popular works like those of Charles Freeman and Carl Sagan still perpetuate this idea.[17]

Of course, all of this was in some sense a well-worn trope even by Mach's time. The image of a dark age had slummed around history for long enough in one form or another to become merely an assumed part of the landscape. Even back when the French *philosophe* Jean d'Alambert spoke of the Dark Ages in his preliminary discourse to the *Encyclopédie* he was merely repeating a prized cliché of both the Reformers and the Humanists.[18] In the French Enlightenment, the trope of "[t]he narrative of 'new science' progressively dismantling all remnants of superstition and Scholasticism in its way was … central to the self-perception of the *philosophes*," as Dan Edelstein puts it.[19] Seeing themselves as emerging from an age of scholastic darkness, both to recover lost ancient wisdom and move beyond it, "offered a seductive account of the discoveries in [their] past century, in conjunction with a more overarching history of human civilizations."[20]

These types of overarching narratives caused d'Alambert to be confused by his scientific hero, Francis Bacon. While trying to draw him as a purely scientific figure heralding a new age, d'Alambert constantly circled around to note his perplexity that "he [Bacon] seems to have shown too much deference or caution to the dominant taste of his century in his frequent use of the terms of the scholastics, sometimes even of scholastic principles."[21] Because of course d'Alambert *knew* that scholasticism was a Bad Thing. Its presence, as a matter of course to d'Alambert, could only confuse. "Twentieth-century historians have produced equivalent wafflings about others on the canonical list [of the Scientific Revolution]" as the late historian of science Betty Jo Teeter Dobbs notes.

> The issue of the proper interpretation of our scientific heroes has been the most pressing of all. … When we look at them a little more closely … [to our astonishment] they are not like us at all … but have [among other things] metaphysical and religious commitments … and horror of horrors, they take seriously such misbegotten ideas as astrology, alchemy, magic, the music of the spheres, divine providence, and salvation history.[22]

Despite the fact that in our own time we are saturated with ideas of The Scientific Revolution as a historical periodization, it is of surprisingly recent vintage. As I.B. Cohen examines at length in his *Revolutions in Science*,[23] the term only came into circulation with Martha Ornstein in 1913, then passed through Alfred North Whitehead in 1923, E. A. Burtt in 1925, John Hermann Randall jr. in 1926, Preserved Smith in 1930, J.D. Bernal in 1939, and in the later 40's and through the 1950's began achieving saturation with the work of Alexander Koyré, Herbert Butterfield, and A. Rupert Hall. Eventually "The Scientific Revolution" was sedimented in our collective imagination by its use in Thomas Kuhn's explosive 1962 work, *The Structure of Scientific Revolutions*. The takeaway here is that all of this scholarship served to reinforce the picture of Galileo as a purely scientific figure

7. H. Floris Cohen, *The Scientific Revolution: A Historiographical Inquiry* (Chicago: University of Chicago Press, 1994), 41.

8. Cohen, *The Scientific Revolution*, 41.

9. William Wallace, *Causality and Scientific Explanation: Volume 1 – Medieval and Early Classical Science* (Michigan: University of Michigan Press, 1972); Mordechai Feingold, *The Jesuits and the Scientific Revolution* (Princeton: Princeton University Press, 1997).

10. Amos Funkenstein, *Theology and the Scientific Imagination From The Middle Ages to the Seventeenth Century* (New Jersey: Princeton University Press, 1986), esp. 117-202; Pietro Redondi, "From Galileo to Augustine," in *The Cambridge Companion to Galileo*, ed. Peter Machamer (Cambridge, UK: Cambridge University Press, 1998),175-210.

11. Cohen, *The Scientific Revolution,* 41.

12. J.L. Heilbron, *The Sun In The Church: Cathedrals as Solar Observatories* (Cambridge: Harvard University Press, 1999).

13. The best introduction and biography of Duhem remains Stanley L. Jaki, *Uneasy Genius: The Life and Work of Pierre Duhem* (Dordrech: Martinus Nijhoff Publishers, 1987); Stanley L. Jaki, *Scientist and Catholic: Pierre Duhem* (Front Roya, VA: Christendom Press, 1991); Pierre Duhem, *Medieval Cosmology: Theories of Infinity, Place, Time, Void, and the Plurality of Worlds*, ed. and trans. by Roger Ariew (Chicago, IL: University of Chicago Press, 1985).

14. John McEvoy, "Positivism, Whiggism, and the Chemical Revolution: A Study in the Historiography of Chemistry," *History of Science* 35 (1997): 1.

15. Dudley Shapere, *Galileo: A Philosophical Study* (Chicago: University of Chicago Press, 1974), 3-8.

16. Shapere, *Galileo,* 8.

17. Charles Freeman, *The Closing of the Western Mind*: *The Rise of Faith and the Fall of Reason* (New York: Knopf, 2003), 307-323; Carl Sagan, *Cosmos* (New York: Ballantine Books, 2013). 171-207.

18. For a survey of early pejorative Protestant uses of "the Middle Ages" see: W.K. Fergusson, *The Renaissance in Historical Thought: Four Centuries of Interpretation* (Cambridge, MA: Houghton Mifflin Co., 1948), 46-58.

19. Dan Edelstein, *The Enlightenment: A Genealogy* (Chicago, IL: University of Chicago Press, 2010), 117.

20. Edelstein, *The Enlightenment,* 2-3.

21. Jean Le Rond d'Alambert, *Preliminary Discourse to the Encyclopedia of Diderot*, trans. Richard N. Schwab and Walter E. Rex, (Indianapolis, IN: Bobbs-Merrill, 1968), 76.

22. Betty Jo Teeter Dobbs, "Newton as Final Cause and First Mover," in *Rethinking the Scientific Revolution*, ed. Margaret Osler (Cambridge: Cambridge University Press, 2000), 34-35.

23. I.B. Cohen, *Revolutions in Science* (Cambridge, MA: Harvard University Press, 1985).

(or, at least, heralding a purely scientific age), and further contrasted him to the church as a purely "religious" body. Dobbs' summary of how this emergence of the periodization of "The Scientific Revolution" affected our picture of Newton, applies analogously to Galileo: "He came down to us as co-opted, an Enlightenment figure without parallel who could not have possibly been concerned [with theology] or establishing the existence and activity of a providential God."[24]

But such co-optations only skew investigations regarding how Scripture and science were actually related to one another. We get a ham-fisted picture of the Church, on one side, using Scripture, and Galileo, on the other, using science. This is not at all the case of the matter. To that, we now turn.

RETHINKING OUR CATEGORIES IN THE RELATIONSHIP OF SCRIPTURE AND SCIENCE: NO DIRECT RELATIONS

Deconstructing some of our typical categories brings us to a tentative (but provocatively stated) observation: there is, and has been, no direct relationship between Scripture and science. This is decidedly *not* meant as a re-statement of Stephen Gould's famous "Non-Overlapping Magisteria" argument. Theology, Scripture, and natural philosophy (and today, science) will indeed often have significant points of overlap, but these convergence points will vary based on other governing assumptions and arguments. This is in part to broadly restate the "Handmaiden" thesis: theology is the ultimate organizer of a series of nested or concentrically arranged strata of sub-alternating disciplines that can inform one another only indirectly as judgments and interpretations are translated between the strata.

DECONSTRUCTING SOME OF OUR TYPICAL CATEGORIES BRINGS US TO A TENTATIVE (BUT PROVOCATIVELY STATED) OBSERVATION: THERE IS, AND HAS BEEN, NO DIRECT RELATIONSHIP BETWEEN SCRIPTURE AND SCIENCE.

In the medieval university, as Andrew Cunningham puts it, while "God and creation were the [ultimate] point of the creation, maintenance, and modification of the study of natural philosophy"[25] nonetheless, as he states elsewhere: "natural philosophy was an autonomous study separate from theology and natural theology."[26] Margaret Osler provides a helpful way of envisioning this when she notes "natural philosophers sometimes appropriate ideas developed in … theology, translate them into the language of natural philosophy, and use them to solve problems in the new context."[27] It is also in part to point out, as Kenneth Howell does in his analysis of how the Bible functioned in Reformation arguments over the legitimacy of Copernican cosmology, that precisely because of the question of hermeneutics in scriptural exegesis, and realism vs. functionalism in science, there was and can be no direct comparison of Scripture with science.[28] Take Augustine's famous summary in his *de Genesi ad Litteram*:

> Whatever they [the philosophers] can really demonstrate to be true of physical nature we must show to be capable of reconciliation with our Scriptures, and whatever they assert in their treatises which is contrary to these Scriptures of ours, that is to Catholic faith, we must either prove as well as we can to be entirely false, or at all events we must, without the smallest hesitation, believe it to be so.[29]

When he wrote his *Sacred Theory of the Earth* (1684) Thomas Burnett lauded St. Augustine for his admonitions not to interlock science and religion too closely. "The danger as Burnett saw it was this," writes John Hedley Brooke. "As science advanced, propositions that Scripture had been made to affirm would be proved false."[30] Shifting suddenly from praise to a tone of obvious disdain, Burnett then chides Augustine for falling headlong into the same trap he so deftly taught us to avoid. "[Augustine] had used the Bible in his dismissal of the Antipodes" that many philosophers like Plato, Aristotle, and Pliny had described. Feeling much wiser at his far end of history in the 17th century, Burnett is confident that he might now prescribe a course that avoids such an illicit equation of the sacred text with direct theories about nature.

As Brooke continues, however, he notes that in our own time readers of Burnett's *Sacred Theory of the Earth* would no doubt find great amusement, and perhaps some befuddlement, that before and after his hand-wringing at what to him was Augustine's obvious infelicity, he himself does much the same with reckless abandon. This is not to scold Burnett, says Brooke, but rather to broach a much more interesting question: "How was it possible for Augustine to behave in a manner that, to a later generation, looked inconsistent? And [the same question goes] for Burnett." Setting up a thesis for his magisterial *Science and Religion: Some Historical Perspectives*, Brooke answers that in part "the domains of science and religion were separated by different boundaries in Augustine's day from those in Burnett's day, and in Burnett's day from our own."[31]

Jaroslav Pelikan makes a similar point regarding the three Cappadocian Fathers—and one Cappadocian Mother, counting Basil of Caesarea and Gregory of Nyssa's sister, Macrina, as Pelikan rightly does:

> Such scientific investigation of nature could … be invoked as a component part for the apologetic interpretation of natural theology. … [However] they did not always make it easy for their

24. Dobbs, "Newton as Final Cause," 38.

25. Andrew Cunningham, "The Identity of Natural Philosophy: A Response to Edward Grant," *Early Science and Medicine,* vol. 5, no. 3 (2000): 269.

26. Andrew Cunningham, "De-Centering the 'Big Picture': The Origins of Modern Science and the Modern Origins of Science," *British Journal for the History of Science*, 26 (1993): 421.

27. Margaret Osler, "Mixing Metaphors: Science and Religion or Natural Philosophy and Theology in Early Modern Europe," *History of Science* vol. 35, no.1 (1997): 101.

28. Howell, *God's Two Books: Copernican Cosmology and Biblical Interpretation in Early Modern Science* (Notre Dame: University of Notre Dame Press, 2002). e.g. 222: "Attempts to resolve inconsistencies [between Scripture and science] were not simply pitting a specific text against a scientific theory. The meaning of the text was examined by the expected rules of exegesis, even if the disputants could not agree on the application of those rules."

29. Augustine, *de Genesi ad Litteram* trans. as *The Literal Meaning of Genesis*, ed. John Hammond Tyler, 2 vols. (New York: Newman Press, 1982), 1.21.41.

30. John Hedley Brooke, *Science and Religion: Some Historical Perspectives* (Cambridge: Cambridge University Press, 1990), 7.

31. Brooke, *Science and Religion,* 8.

> readers—and it seems sometimes to have been difficult also for them—to recognize when this appeal to what was regarded as scientific fact [in their day] was intended for illustration of rhetorical technique, and when it was intended for proof as logical argument; for in their thought, and not only theirs, the line between the two was easier to cross than it was to draw.[32]

More surprisingly, as we will have occasion to briefly investigate, similar comparisons can be made between Galileo's view of the Scriptures, and those of Cardinal Bellarmine, the man who had the task of admonishing Galileo on behalf of the Inquisition. One would assume, given the historical caricature that Galileo would perhaps take a loose, allegorical or accommodationist approach to account for progressing "science," while Bellarmine would be a hard nose literalist opposed to anything that smacks of revisionism. Yet, if we hold up representative quotes side by side without attribution, it is difficult to tell who is who:

> 1.) I say that if there were a true demonstration that the sun is at the center of the world and the earth in the third heaven, and that the sun does not circle the earth but the earth circles the sun, then one would have to proceed with great care in explaining the Scriptures that appear contrary, and say rather that we do not understand them, than that what is demonstrated [in science] is false.
>
> 2.) In the learned books of worldly authors are contained some propositions about nature which are truly demonstrated, and others which are simply taught; in regard to the former [that which is demonstrated] the task of wise theologians is to show that they are not contrary to Holy Scripture; as for the latter (which are taught but not demonstrated with necessity), if they contain anything contrary to the Holy Writ, then they must be considered indubitably false and must be demonstrated such by every possible means.

Both statements in good Augustinian fashion appear to say that if heliocentrism could be demonstrated, then we would have to be cautious about our understanding of the meaning of Scripture in those passages that appear to teach geocentrism. On this they are united. The second statement appears, however, slightly more reactionary: propositions taught but not demonstrated with *certainty* (that is, *deductive* certainty, which is quite a high standard of demonstration) that conflict with Scripture must be considered false, and "demonstrated [false] by any means necessary." This too, is Augustinian language. But here is the tricky part undermining our usual historical narratives about the Church using Scripture against science: Galileo's is actually the second, more conservative sounding statement, while Bellarmine's is the first, more cautiously "progressive" sounding.[33] As we shall see, a lot turned on what either man thought was a sound scientific demonstration, and indeed whether scientific demonstration was "functionalist" or "realist."[34] It turns out, Galileo did not—even by the standards he set for himself—prove that the earth went its merry way about the sun and among other mitigating factors this was a key hinge for the debate all around. All of this is to say, when we are asking about the relationships between Christianity and natural philosophy (or today, science) we are aiming at something of a moving target whose form also shape-shifts in any given era, in any given institutional context, and indeed even through the idiosyncrasies of an individual thinker.

CASE STUDY: THE USES OF SCRIPTURE IN THE COPERNICAN DEBATES

Historian of science Ernan McMullin[35] in an excellent essay on Galileo's use of Scripture, helpfully lays out what he takes to be the distillation of hermeneutical principles at work in Galileo (and which McMullin takes to be largely Augustinian):[36]

> <u>The Principle of Prudence:</u> When investigating a difficult passage, entertain as many interpretations as possible, keeping in mind new truths in the future might adjudicate between them.
>
> <u>The Priority of Demonstration:</u> When a demonstrated truth about nature conflicts with an interpretation of Scripture no matter how prima facie "literal," Scripture should cautiously be reevaluated.
>
> <u>The Priority of Scripture:</u> Where an opinion about nature in natural philosophy that appears contradictory to Scripture has not been soundly demonstrated, the literal sense of Scripture must be preferred.
>
> <u>The Principle of Accommodation:</u> The words and sense of Scripture are often accommodated to the capacity of humanity's ability to understand, and not necessarily to reveal the essence of phenomena themselves.
>
> <u>The Principle of Limitation:</u> The primary concern of Scripture is to communicate God's nature, character, and plan of salvation, not scientific descriptions of the world.

Thus while the debates over Copernicanism, and eventually the condemnation of Galileo, seem to be a perfect case of the church using Scripture to hamper the progression of science, things are much more complicated. Unfortunately, popular representations have rode roughshod over such nuance. Bertrand Russell in his immensely popular *History of Western Philosophy*[37] places a very anti-Copernican phrase into the mouth of Calvin, thus reinforcing the idea that in general the church was against the scientific revolution of heliocentrism:[38] "Who will venture to place the authority of Copernicus above that of the Holy Spirit?" Edward Rosen, who is an expert on the reception of Copernican theory, was quite interested in this juicy quote as he was previously unaware of Calvin's opinions on the matter. Now, Russell's book was originally based on lectures, and so Russell up front apologizes and says that he has not tracked all his sources down for

32. Jaroslav Pelikan, *Christianity and Classical Culture: The Metamorphosis of Natural Theology In the Christian Encounter With Hellenism* (New Haven, CT: Yale University Press, 1993), 99.

33. For Bellarmine's statement cf. "Cardinal R. Bellarmine to P. Foscarini, 12 April 1615" *The Galileo Affair: A Documentary History,* ed. Maurice Finocchiaro (Oakland, CA: University of California Press, 1989), 68; for Galileo's statement, cf. Galileo "Letter to the Grand Duchess Christina (1615)" in Finocchiaro, *The Galileo Affair*, 101-102.

34. The necessity of taking into account the "functionalist" vs. "realist" debate in science is one of the major theses of Howell's *God's Two Books*.

35. Ernan McMullin, "Galileo on Science and Scripture," in *The Cambridge Companion to Galileo*, 271-347.

36. For some subtle differences between Augustine and Galileo, see Eileen Reeves, "Augustine and Galileo on Reading the Heavens," *Journal of the History of Ideas* vol. 52 (1991): 563-571.

37. Bertrand Russell, *A History of Western Philosophy* (New York, NY: Simon & Schuster, 1967), 528.

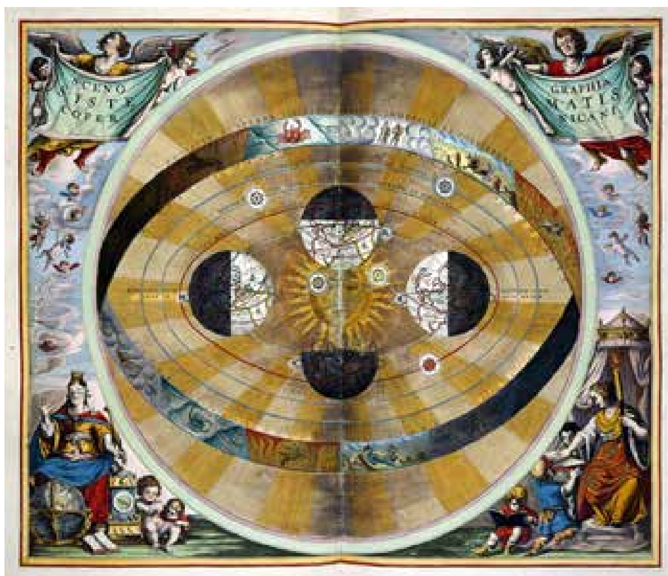
38. Edward Rosen, "Calvin's Attitude Toward Copernicus," in *Copernicus and His Successors* (London, UK: Hambledon Press, 1995), 161–173.

citation. This is what happened here. As Russell did note, however, he was "quite indebted" to Andrew Dickson White.

Thus Rosen turned to this work next to find the source for this quotable Calvin. When he compared how a similar quote appeared in a later work from White, to the one in Russell, Rosen concluded "We shall feel fully justified that it was from White, not Calvin, that Russell took the anti-Copernican exclamation that interests us."[39] White himself got the quote from an Anglican canon F.W. Farrer (at one time a chaplain to Queen Victoria), but from there the trail again goes cold. Farrer was typically dependent upon his normally capacious memory, and so does not cite where he himself got the quote in Calvin's works. In fact, as his journey continued, Rosen came to the conclusion that not only did Calvin never utter this sentence, looking over the entirety of Calvin's works, Calvin had most likely never even heard of Copernicus. "What was Calvin's attitude toward Copernicus? Never having heard of him, Calvin had no attitude towards Copernicus."[40] And yet, in addition to Russell, Rosen notes nine other prominent historians who had used this phantom quote to push the warfare agenda.[41]

Calvin's phantom is nonetheless similar to a real remark given by Luther at a Table Talk in 1539, several years before the release of Copernicus' masterwork, *de Revolutionibus*. Word had been spreading initially about some of Copernicus' theories before hand with the publication of the slender *Commentariolus,* which had been circulating since 1514, and Luther was recorded to have said:

> He who wants to be clever must agree with nothing that others esteem. He must do something of his own. This is what that fellow does who wishes to turn the whole of astronomy upside-down. Even in these things that are thrown into disorder, I believe Holy Scriptures, for Joshua commanded the sun to stand still, not the earth.[42]



THE COPERNICAN SYSTEM. IMAGE TAKEN FROM ATLAS COELESTIS, 1660

Case closed, right? This seems to be a clear instance of the idea that Scripture was a vehicle used against scientific advance. However, Luther's quote cannot really be regarded as an informed dissent. First of all, it was not recorded or authorized by Luther himself, but by someone present at the Table Talk who did not publish these remarks until after Luther's death. It isn't entirely clear that Copernicus is even in view, and not some other astronomer's second-hand (and second-rate) reworking of Copernicus' ideas. Moreover, this statement attributed to Luther was hardly influential as an opinion among the Reformers, if at all. While Andrew Dickson White and others love to cite Melanchthon as being a fellow conspirator against Copernicus, they fail to note that whatever Melanchthon's disagreements with Copernicus, he in his own words "[began] to love and admire Copernicus all the more"[43] as he supplanted Copernican calculations in the place of Ptolemaic ones (if not wholesale adopting Copernicus as a physical model of the solar system).[44]

And a crucial point that is all too often underemphasized—especially by those eager to turn these scenarios into straightforward cases of Scripture being used against science—the opponents of Copernicus even through Galileo's day were not critiquing it primarily religiously, but scientifically.[45] Even after *de Revolutionibus* was printed and circulating among scholars through Europe, there was no real reason to assume it had proven heliocentrism as a physically true theory. Thus McMullin's "Priority of Scripture" principle above, kicks in. Luther—and anyone else—would not have immediate cause to change their scriptural interpretations. It is as such not a clear case of "Scripture vs. science" at all, but rather Scripture corroborating a widely held, predictively successful Ptolemaic theory in the face of an as-yet unverified rival.

On top of the scientific debates that were still ongoing about Copernicanism, an anonymous preface entitled "Letter to the Reader" (which Johannes Kepler later discerned had been written by the Lutheran Andreas Osiander) indicates that what is contained in *de Revolutionibus* is a clever mathematical theory that aids predicting stellar motion, but not a physical theory about the actual physical layout of the solar system. Pierre Duhem notes that Osiander was not contriving an *ad hoc* device to make Copernicanism palatable; rather such a "functionalist" understanding of astronomy had a venerable pedigree which Osiander was following.[46] Robert Westman argues at length about this particular disciplinary distinctive, noting Osiander was trying to keep the peace—not between science and religion—but between the proper ordering of the humanities.[47] Thus this functionalist gloss to Copernicus was a double boon for Osiander's academy at Nuremberg, in that it both preserved geocentrism and avoided the internecine de-

39. Rosen, "Calvin's Attitude," 163.

40. Rosen, "Calvin's Attitude," 171.

41. It turns out Calvin said something that on the surface could be taken as vaguely similar. But the mitigating circumstances around this qualify it as directly anti-Copernican. Cf. Robert White, "Calvin and Copernicus: The Problem Reconsidered," *Calvin Theological Journal* 15 (1980): 233-243.

42. Martin Luther, *Luther's Works* vol. 54 *Table Talk,* ed. Helmut T. Lehmann (Philadelphia: Fortress Press, 1967), 358-359.

43. Philip Melanchthon, *Corpus reformatorum, Phillipi Melanchthonis opera, quae supersdunt omnia*, ed. C.G. Bretschneider and H.E. Bindsell, 28 vols. (Halle: Schwetschke and Son, 1834-1860), 11: 839. I'd like to thank Professor Rod Stiling for pointing this reference out to me.

44. On this, see: Peter Barker, "The Role of Religion in the Lutheran Response to Copernicus," in *Rethinking the Scientific Revolution,* 59-88.

45. Christopher M. Graney, *Setting Aside All Authority: Giovanni Battista Riccioli and the Science Against Copernicus in the Age of Galileo* (Notre Dame: University of Notre Dame Press, 2015).

46. Pierre Duhem, *To Save the Phenomena: An Essay On the Idea of Physical Theory From Plato to Galileo* (Chicago: University of Chicago Press, 2015).

47. Robert S. Westman, "The Astronomer's Role in the Sixteenth Century: A Preliminary Study," *History of Science* vol. 23 (1980): 105-147.

bates between Aristotelians and theologians about how to organize knowledge into a total package:

> Concerning hypotheses, I have always thought of them, not as articles of faith, but as a foundation for calculation so that, even if they are false, they carefully exhibit only the appearance of the motion. … In this way, you may pacify the Aristotelians and the theologians that you fear contradicting.[48]

We are therefore in the strange position of acknowledging that even those who completely accepted Copernicus' system may not have felt obliged to change their reading of Scripture. On the other hand, those who did preserve their reading of Scripture against Copernicus—perhaps even Luther—were doing so not against science, but in support of a longstanding, predictively successful scientific model. Despite a popular legend that says the Ptolemaic system was becoming increasingly burdened by the endless additions of epicycles adjusting for errors in its predictions, this was largely not the case.[49] As far as predictive power, professor emeritus of astronomy and the history of science at Harvard University, and senior astronomer emeritus at the Smithsonian Astrophysical Observatory Owen Gingerich argues that on the whole we would be hard pressed to discern the difference in accuracy between the Ptolemaic and Copernican systems. The real difference between them, he says in his famous essay "Crisis or Aesthetic?" was a matter of aesthetic judgment. Surely, thought Copernicus, God would not have made a universe in need of all these ugly epicycles? By maintaining that the earth is a moving platform that also spins on its axis, Copernicus was able to account for the retrograde motion originally explained by epicycles, and eliminate what he deemed to be an irredeemably ugly Ptolemaic idea from his new model.[50] But this did not at all *prove* heliocentrism. In many ways, the Copernican model of the solar system was merely an inversion of the Ptolemaic.

Let us therefore recall the general agreement between Galileo and Bellarmine that we were met with above regarding good hermeneutical practice: only if a sound demonstration of heliocentrism was on offer would we be led to a cautious rethinking of passages that appear to teach otherwise. Thus there are at least two conditions: a.) the status of Copernicanism as either functionalist or realist and b.) the demonstration of its accuracy either way. The Pope himself agreed on the conditions of this situation, and used the functionalist interpretation of Copernicus against Galileo:

> Let us grant you that all of your demonstrations are sound and that it is entirely possible for things to stand as you say. …[Yet] you will have to concede to us that God can, conceivably, have arranged things in an entirely tdifferent manner, while yet bringing about the effects that we see. And if this possibility exists, which might still preserve in their literal truth the sayings of Scripture, it is not for us mortals to try to force those holy words to mean what to us, from here, may appear to be the situation.[51]

This no doubt stung a bit extra for Galileo, because Tycho Brahe had actually come up with an alternative physical arrangement. In what has been dubbed "geoheliocentrism" Tycho imagined the earth in the center being orbited by the sun. The twist was that the rest of the planets in turn orbited the sun, not the earth. Constantly infuriating for Galileo, observationally and mathematically it was not possible at the time to differentiate between the Tychonic and Galilean models. In part, this was also responsible for the fallout that Galileo had with the Jesuits, who supported Galileo throughout his career but were more interested in Brahe because he both preserved the phenomena, and allowed one to retain geocentrism. Heliocentrism as a scientific hypothesis for Galileo was really more of a cluster of aesthetic intuitions and anti-Aristotelian arguments held together by assertion and the force of Galileo's wit. It never rose to the level of proof: "So Galileo had arguments rather than proof," as David Lindberg puts it.[52]

To make matters worse not everyone trusted Galileo's telescopes to do the heavy lifting he claimed they could. "We must divest ourselves of the gift of hindsight when reviewing this circumstance,"[53] writes Oxford historian Allan Chapman.

> Since classical times, the *true* instruments of the astronomer were graduated, angle measuring instruments based on the properties of a 360-degree circle. Astronomical truth lay in measurement and geometry: it did *not* lie in strangely magnified images of familiar bodies like Jupiter or Saturn, sometimes complete with image distortions and false color fringes. … Light being bent and distorted down a tube [was considered] an absurdity [and without further justification] clearly full of false information that no wise philosopher could be expected to give credence to what appeared through the eyepiece.[54]

Furthermore, when we think of Galileo's telescope, we may be imparting images of our own modern giant observatories, or even modern personal telescopes. But such precision was unheard of in Galileo's day—where many professional astronomers across Europe *with aid of Galileo's personal telescope* could not duplicate his findings. For example, Johannes Kepler's pupil, with the amusing name of Horky, wrote on the 24th and 25th of April 1610 that Galileo had taken his own personal telescope to the house of the astronomer Magini of Bologna to demonstrate to twenty-four professors in attendance. "I never slept on the 24th or 25th of April," writes an almost breathless Horky:

> But I tested the instrument of Galileo in a thousand ways, both on things here below and on those above. *Below it works wonderfully* [emphasis added]; *in the heavens it deceives* [emphasis added] … as some fixed stars are seen as double. I have as witnesses most excellent men and noble doctors … and all have admitted the instrument to deceive … This silenced Galileo and on the 26th he sadly left quite early in the morning … not even thanking Magini for the splendid meal.[55]

Magini himself, writing a letter to Kepler, added regarding the occasion at his abode:

48. Quoted in Howell, *God's Two Books*, 46.

49. Cf. Thomas Kuhn, *The Structure of Scientific Revolutions* 3rd ed. (Chicago, IL: University of Chicago Press, 1996). 69.

50. Owen Gingerich, "Crisis versus Aesthetic in the Copernican Revolution," *Vistas in Astronomy* 17:1 (1975), 89.

51. Quoted in Giorgio de Santillana, *The Crime of Galileo* (Chicago, IL: University of Chicago Press, 1955), 166.

52. David C. Lindberg, "Galileo, The Church, and the Cosmos," *When Science and Christianity Meet*, ed. David C. Lindberg and Ronald L. Numbers (Chicago, IL: University of Chicago: 2003), 43.

53. Allan Chapman, *Stargazers: Copernicus, Galileo, the Telescope, and the Church* (Oxford, UK: Lion Books, 2014), 160.

54. Chapman, *Stargazers,* 160.

55. Quoted in Paul Feyerabend, *Against Method* (London, UK: Verso, 2010), 85.

> He [Galileo] has achieved nothing; for more than twenty learned men were present yet nobody has seen the new planets distinctly; he [Galileo] will hardly be able to keep them.[56]

Then Kepler himself—the great champion of heliocentrism!—sent a letter to Galileo that must have wounded deeply: "I do not want to hide it from you that quite a few Italians have sent letters to Prague asserting that they could not see those stars [the moons of Jupiter] with your own telescope."[57] Later, in his *Optics*, Kepler in fact uses *naked eye observations* against Galileo's telescope: "It seemed [as I looked through Galileo's telescope] that something seemed to be missing on the outermost periphery [of the moon],"[58] as the telescope seemed to warp and smooth the outermost edges of observation. Chapman confirms from his own experience how difficult historical examples of Galilean telescopes are to work with: "The ray of light emerging from a Galilean eyepiece is very narrow, and making it fall, sharply focused upon one's retina can be quite a job, until one gets the hang of it. In 1610-1611, that was only the beginning: making logical *sense* of what you saw was another matter entirely."[59]

CONCLUSIONS

Unfortunately, as Galileo had to navigate the complex dynamics of patronage mechanics and court politics, he also had to become increasingly vocal—and not less so—about the *physical* truth of his system so as to not lose prestige. Far from "science vs. religion," Galileo's particular self-fashioning and his clash and eventual condemnation by the church cannot be understood outside of this context.[60] Thus, while ostensibly Galileo, Bellarmine, and the Pope could at least at one time be said to have agreed on the relevant hermeneutical principles in regard to Scripture, they could not agree on the application of those rules. And this is so precisely because they did not believe Galileo had demonstrated his claims. Of course, Galileo could believe little else than positive things about his demonstrations, for the sake of his own financial survival and reputation. This confidence in the face of what many took to be unproven assertions became even more problematic in a counter-Reformation context, where looking like one was interpreting Scripture for oneself against the magisterium was a chief concern.[61]

Even here then, in what is held up as the essential historical example of Scripture being used as a blunt instrument against the progress of science, the story is incredibly more complex. But complex history makes for bad sound bites, and so the story continues to circulate through academic works and the popular imagination. In fact, however, the Galileo affair gives us an incredibly sophisticated snapshot regarding how scriptural reasoning was paired with observations and analysis of the natural world. We would all benefit from paying attention to this much misunderstood historical episode today, as we continue to navigate the ever-new mysteries unfolding before us in the awe-inspiring theater that is God's creation.

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56. Quoted in Feyerabend, *Against Method*, 85.

57. Quoted in Feyerabend, *Against Method*, 85.

58. Quoted in Feyerabend, *Against Method,* 89.

59. Chapman, *Stargazers*, 161.

60. Mario Biagioli, *Galileo Courtier: The Practice of Science in the Culture of Absolutism* (Chicago: The University of Chicago Press, 1993), esp. 313-353 for the recontextualization of his trial.

61. Richard Blackwell, "Galileo Galilei," in *Science & Religion: A Historical Introduction*, ed. Gary Ferngren, (Baltimore, MA: Johns Hopkins University Press, 2002), 108: "If Copernicus' book had been published either one hundred years earlier, or one hundred years later, the Galileo affair would probably not have happened. But, in fact, it was published in 1543, when the Reformation was in full bloom, and the [Catholic] Counter Reformation was just beginning. Hence it was by 1616 all of the actors and cultural forces were in place for the drama of the Galileo affair to begin."

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