

What a 400-Year-Old

Letter Teaches Us

about Faith

and

Science

GOD AND GALILEO



David L. Block

and

Kenneth C. Freeman

“These two eminent astronomers, one from Australia and one from South Africa, bring a unique perspective to the faith and science arena. What they reveal about Galileo—who is often cited as an example of the great divide—demonstrates instead that strong faith and expert science can go together. Indeed, the authors themselves follow in Galileo’s path, approaching both fields with a spirit of humility and wonder.”

Philip Yancey, author, *What’s So Amazing About Grace?* and *The Jesus I Never Knew*

“Galileo showed us how to write in the book of nature, but his world read only from the book of Scripture—thus descended a debate that tore Galileo’s world apart and has never been reconciled, even to our time. *God and Galileo* is a personal journey through the world of two books, nature and Scripture, guided by leading astronomers who have wondered, like many others, why we cannot seem to read clearly from both books at the same time. Their conclusion is that we can and, to reach our fullest understanding, we should. Galileo concluded the same but was not allowed to speak it. *God and Galileo* finally gives him a voice.”

Bruce Elmegreen, Astrophysicist, Thomas J. Watson Research Center, IBM; recipient, Dannie Heineman Prize for Astrophysics (2001)

“With so many scientists seeing Christian faith as irrelevant to scientific truth and so many Christians seeing science as contradictory to Christian truth, this unique, groundbreaking, and deeply researched book by two believing, distinguished, and top-drawer astronomers is one that had to be written. It makes clear that the totality of truth has to be drawn on the one hand from the book of Scripture, with its story of grace and incarnation, and on the other hand from the book of nature, with its story of space and matter. Both books are vital to the full comprehension of reality, and the authors show this with convincing clarity. We dare not be blind either to nature or Scripture, whose respective truths are complementary, not contradictory, because both have the same author. *God and Galileo* brings us unique perspectives and insights related to faith, grace, and astronomy not evident in any other contemporary writing. My prayer is that it will be a landmark contribution to this debate and a classic both for today and for generations to come.”

Michael Cassidy, Founder, African Enterprise; Honorary Cochair, Lausanne Movement; author, *The Church Jesus Prayed For*

“*God and Galileo* needed to be written. The majority of scientists today are either atheist or agnostic, and there is rarely any discussion about the relationship between the physical and spiritual realms of knowledge. In scientific circles, these subjects mix like oil and water. Yet the relationship between a Creator and the origin of the universe is an important subject of fundamental interest to everyone. Is there a connection between science and religion, or are the two in conflict as completely independent realms of knowledge? This book addresses this question head-on. Written by two leading international researchers in astronomy, the book reflects extensively on the interaction between the universe of space and the God of grace. To make their point, the authors offer personal and contemporary reflections on a 1615 letter written by Galileo Galilei, in which he addresses this very conflict between revelation and reason. *God and Galileo* is a devastating attack on the dominance of atheism in science today. It is a must-read, offering proper perspective on life and why we exist in the universe.”

Giovanni Fazio, Senior Physicist, Harvard-Smithsonian Center for Astrophysics; Fellow, American Physical Society; recipient, Henry Norris Russell Lectureship (2015)

“In a world growing increasingly hostile to Christianity, clarity is our first and best defense. Indeed, the challenge for the believer today is to tread fearfully in such a world and to remain true—that, and to be well informed. Among other things, that means exercising caution when choosing whom to listen to. This is one of the great payoffs of this book. *God and Galileo* is about clarity in its best and most attractive sense. Using the words of Galileo Galilei as a prop, and with language accessible to the general reader, astronomers Block and Freeman conduct an intimate dialogue with history. Tampering with deep cultural memory, they explore the harmonies and agreements that exist between the book of nature and the book of Scripture, being, as they were, according to Galileo, crafted by the same author.”

David Teems, author, *Tyndale: The Man Who Gave God an English Voice*

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What a 400-Year-Old Letter
Teaches Us about Faith and Science

David L. Block and Kenneth C. Freeman

God and Galileo: What a 400-Year-Old Letter Teaches Us about Faith and Science

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We dedicate our book to the memory of the martyr William Tyndale.

His translations have been pivotal to our readings of the New Testament and to the grace of God described therein. As W. R. Cooper noted, “The printing in 1526 of William Tyndale’s translation of the New Testament from Greek into English was arguably the most important single event in the history of the English Reformation.”

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Photographs follow page 160.

Preface

The truth of nature belongs to the physical or scientific realm. In contrast, the much broader nature of truth includes both the physical and spiritual domains; God's revelation of himself to us is the work of his grace. To insist that truth lies in only one or the other domain is only half the story, as in watching trees swaying and bending without recognizing the presence of the wind.

In earlier times, the church and its cardinals ruled supreme and misused the book of Scripture, claiming that it asserted things about science that it did not assert, all the while paying little regard for experimental science. This situation was clearly out of balance. Scripture is wholly true in all that it claims, and when interpreted rightly, it harmonizes perfectly with the book of nature. The church had misunderstood this principle and used Scripture to silence science.

The situation today is equally out of balance, to the other extreme. The scientific book of nature is paramount today, and many high-profile scientists would have us abandon the Scriptures entirely as a source of truth about our world. The philosophical viewpoint of these self-appointed "cardinals of science" is driven as much by the mood of the age and the personalities and beliefs of individuals as it is by scientific data and rigorous theory.

Today atheist fundamentalism rules, with its basic philosophical agenda to avoid any need for a Creator. In this book, we, as two professional astronomers, reflect on the universe of space and the grace of God. We comment on the subjective and territorial nature of science and affirm that the science of today is not in a position to pronounce on the existence of God. We argue that God is ultimately known not through human logic or experiment but through his self-revelation.

Our reflections sweep from the universe of galaxies to the universe of the heart. In the words of Blaise Pascal, “The heart has its reasons, which reason does not know. We know the truth not only by the reason, but also by the heart.”¹ This is God’s universe, wherein grace prevails: we need to be receptive to both reason and revelation. It should not surprise us that people who are trying to make sense of this world are provided with a map by the Maker of this world, who, by his grace, has visited his world in person.

It is these shared beliefs that led to the writing of this book. Our story starts at the Siding Spring Observatory near Coonabarabran, some 350 miles north of Canberra and home to the largest optical telescope in Australia. We had completed our work at the observatory, and we started driving back to Canberra. Something was on our minds while we were on our long drive that day. We had been thinking about writing a book on science and our personal relationship with God. While many books have been written about the harmony of science and God, we had encountered several books in Australia by scientists that have swayed the opinions of many away from God. But there was a *new* perspective we could add.

From Coonabarabran we drove through the town of Parkes, in Western New South Wales. Parkes is another astronomy town, with its huge radio telescope looming on the horizon. After a few more hours of talking in the car, we reached Canberra, and our book had been conceived. We were determined not to add yet another book to the God-science debate but rather to share our thoughts on the grace of God in the context of science. To be specific, we aimed to consider the grace of God, who had entered the restrictions of space and of time. Pascal spoke of our God humbled, our God weeping, our God dying, Jesus incarnate. In more modern times, Albert Einstein, one of the greatest scientists of all time, refers to Jesus as “the luminous figure of the Nazarene.”²

1. From Blaise Pascal, *Pensées* (1670), in Blaise Pascal, *Thoughts*, trans. W. F. Trotter, in vol. 48 of *The Harvard Classics*, ed. Charles W. Eliot (New York: Collier, 1910), 99. The original French quote reads thus: “Le cœur a ses raisons, que la raison ne connaît point.” Blaise Pascal, *Pensées, Fragments et Lettres de Blaise Pascal*, ed. Armand-Prosper Faugère (Paris: Andrieux, 1844), 2:172.

2. “What Life Means to Einstein: An Interview by George Sylvester Viereck,” *Saturday Evening Post*, October 26, 1929, 117, <http://www.saturdayeveningpost.com/wp-content/uploads/satevepost/einstein.pdf>.

Our book took us to Florence and Venice, key places in Galileo Galilei's life; to the secret Vatican archives in Rome; to the island of Murano, famed worldwide for the production of glass, a crucial component in the manufacture of many optical telescopes; and to archives where we held the original manuscripts of Galileo and Nicolaus Copernicus in our hands.

It also took us to France, the land of Blaise Pascal (1623–1662). The genius of Pascal as a scientist is beyond question. But what has intrigued us about Pascal was his experience with God, of knowing God—his “night of fire,” describing his cataclysmic personal encounter with God in 1654. We wished to appreciate the greatness of the scientist Pascal—to enter sympathetically into the spirit of the age in which he lived—and for that we had many discussions in Paris with the late Professor Jean Mesnard, one of the greatest experts of our time on Pascal. Pascal never came away with religion but with the wonder of actually knowing God, at a personal level. He penned his innermost feelings, which became his famous *Les Pensées*.

Here we offer our thoughts and experiences, as astronomical researchers with careers jointly spanning more than ninety-five years. They are our thoughts. Others may disagree. Are we trained theologians? No, but then neither were Peter the fisherman or Matthew the tax collector. Even as we benefit greatly from trained Christian theologians, grace is freely imparted to all willing to receive.

Our first theme focuses on the *modus operandi* of scientists, their methodologies, their goals, the manner in which science has largely molded the prevailing mood of our age, and the limitations of the scientific method. These are insights that people who are not scientists may be unaware of. Our second theme is a question: When did science lose its grace? Here is what we mean: When and why have so many scientists today been blinded to the grace of God, unlike scientific giants like Pascal and Galileo?

Galileo makes a particularly constructive contribution to these questions in his famous 1615 *Letter to the Grand Duchess Christina of Tuscany*. His letter is full of insights into the science-religion interface, and we use it as a basis for our book. This is not a book about Galileo. However, excerpts from the letter appear throughout our

discussion in italics, and we use the letter as a springboard for our perspectives as professional astronomers, four hundred years later, on the mood of our age and our own exposure and response to God's grace and revelation. In Galileo's time, theology was the queen of all the sciences. Today, in the minds of multitudes, science is god. Is science indeed the new savior of mankind?

Readers of the atheist literature may come away from such volumes believing that science has made God unnecessary. We wrote this book to offer a different perspective. Although science can illuminate the glories of the creation, we argue that it is beyond the domain of science to infer that God does not exist. God exists outside space and time. Science does not have the weapons to expunge God's Spirit or the revelation of his spiritual kingdom. At the heart of God's kingdom is grace.

This is a book about the God whom we have come to know—both through Scripture and in personal experience. In a universe spanning approximately 92 billion light years, we have come to know its Creator.

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Our first visit to Florence was organized by the late Francesco Palla, director of the Arcetri Observatory, who had been introduced to us by our mutual friend and colleague Joe Silk (Emeritus Savilian Professor at Oxford University). We are indebted to Palla for showing us Galileo's final home, Il Gioiello, and for contacting Isabella Truci and Susanna Pelle at the Biblioteca Nazionale Centrale di Firenze—they graciously allowed us to examine manuscripts written in Galileo's hand. Palla also introduced us to the optician Giuseppe Molesini, of the Istituto Nazionale di Ottica in Florence, and we thank him for helpful discussions concerning Galileo's telescopes and the optical testing of his lenses. The hospitality extended by Edvige Corbelli in Florence to one of us (David) when visiting Il Gioiello a second time is gratefully acknowledged.

We remain indebted to the legendary Venetian historian on glass Rosa Barovier Mentasti for the time that she spent with one of us

(David). Galileo had compared the appearance of the moon through spyglasses or telescopes to that of cracked or “ice glass.” We were fascinated by this comparison and are very grateful to Rosa Barovier Mentasti for explaining this to us. No talk of the history of glass in the Veneto would be complete without mentioning the Barovier family, predating the time when Galileo walked the streets of Venice.

In Rome, we were privileged to have a discussion with Giuseppe Tanzella-Nitti of the Pontificia Università della Santa Croce, focusing on the subject of the book of nature and the book of Scripture. We also thank Marinella Calisi for allowing us to examine a published copy of Galileo’s *Sidereus Nuncius* at the Osservatorio Astronomico di Roma.

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We warmly thank Walter C. Kaiser Jr., president emeritus and distinguished professor of Old Testament at Gordon-Conwell Theological Seminary in Massachusetts, for valuable insight into biblical exegesis.

We enjoyed visits to Owen Gingerich, professor emeritus of astronomy and the history of science at Harvard University, for discussion—and for the privilege of examining various precious historical books, including an early edition of *De revolutionibus orbium coelestium* by Nicolaus Copernicus. We thank him and our colleague George Ellis, emeritus distinguished professor of complex systems in the Department of Mathematics and Applied Mathematics at the University of Cape Town in South Africa, for correspondence and for sending us some of their articles.

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assistance to us in Poland was the librarian Dorota Antosiewicz; she spared no efforts in facilitating the examination of rare astronomical treatises. The funding for our visit to Poland was enabled by the persistent efforts of Louise Hirsch in Melbourne, to whom we are very grateful; our thanks go to Rita Ivenskis, Linda Bedford, Ros and Hedy Garson, Margaret Mascara, and Louise and Lawrence Hirsch.

We extend our deepest gratitude to Anna Teicher in Cambridge for so readily translating a section (from Italian into English) of a poem by Galileo for us, titled “Against Wearing the Gown.” We also thank the director, Professor Paolo Galluzzi, and librarian, Daniela Pozzi, at the Museo Galileo in Florence for their assistance. We profoundly thank Sara Bonechi at the Museo Galileo for her deep insights into Galileo’s poem and for introducing us to Anna Teicher.

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Our warm thanks go to Philip Yancey, David Teems, Giovanni Fazio, Bruce Elmegreen, and Michael Cassidy for writing endorsements of our book. We are also grateful to David Munro, Mark and Heather Stonestreet, and Anke Arentsen for reading a first draft of our book and for offering their inspiring thoughts. We are indebted to Celeste Johnson for her fastidious accuracy in proofreading Galileo’s letter in the appendix.

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It is a great pleasure to thank our editor at Crossway, David Barshinger, for his meticulous attention to detail combined with his profound professional insights into the structuring of our text. His editorial skills are astonishing. His firm and pleasant interaction with us throughout the editing process is greatly appreciated.

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Finally, we warmly thank our friend Michal Dabrowski. The tone of our book was changed by his emails. It was Michal who urged us not to write simply a historical account of Galileo's scientific and religious challenges of long ago but to also focus on the grace and revelation of God in our personal walk with him.

To each person who helped us synthesize our thoughts on the universe of space and the God of grace, we thank you.

David L. Block and Kenneth C. Freeman
Johannesburg and Canberra
2018

PART 1

GRACE AND SPACE

Setting the Stage

The dispute between the church and Galileo sowed the seed for the apparent divorce between science and faith. The dispute was about the theory of the universe, presented by Nicolaus Copernicus (1473–1543) in 1543, that the sun was at the center of the universe. This theory was in opposition to the Aristotelian view promoted by the church, that the sun and other planets were in orbit around the earth. Galileo favored the Copernican model because of what he observed through his own telescopes, particularly that the moons of Jupiter were in orbit around the planet Jupiter. These were landmark telescopic observations—not all bodies in the universe were orbiting the earth!

Copernicus’s theory was regarded as heretical because it clashed with the church’s interpretation of the biblical creation account, in which God “set the earth on its foundations” (Ps. 104:5 ESV). Harvard historian Owen Gingerich carefully elaborates:

As far as the theologians were concerned, the Copernican system was not really the issue. I can hardly emphasize this point enough. The battleground was *the method* itself, *the route* to sure knowledge of the world, *the question* of whether the Book of Nature could in any way rival the inerrant Book of Scripture as an avenue to truth.¹

Who controls the access to the wells of truth?

Pope Urban VIII allowed Galileo to continue his investigations of the heavens, provided his findings were presented as theory, not

1. Owen Gingerich, “The Galileo Affair,” *Scientific American* 247, no. 2 (1982): 123–24; italics added.

as fact. But in the end, Galileo could not restrain himself from fully embracing the heliocentric system.

Galileo was summoned from Florence to Rome for trial by the Inquisition in 1633. He saw no conflict between the domains of scientific research and faith in God. He believed that study of the universe would promote greater understanding of the correct interpretation of the Scriptures. But the label of Galileo as a suspected heretic prevailed in the trial, and he was forced to recant and sentenced to house arrest: he died in Arcetri and on January 9, 1642, was buried in an unmarked grave.²

Galileo was far-reaching in his views: he saw the difference between the nature of truth (Scripture) and the truth of nature (science).³ Although it soon became clear that Galileo's worldview was correct, it took until 1992 for the church to offer an acknowledgment of the error of the theologians at the time. Here are the words from Pope John Paul II:

Thanks to his intuition as a brilliant physicist and by relying on different arguments, Galileo, who practically invented the experimental method, understood why only the sun could function as the centre of the world, as it was then known, that is to say, as a planetary system. The error of the theologians of the time, when they maintained the centrality of the earth, was to think that our understanding of the physical world's structure was, in some way, imposed by the literal sense of Sacred Scripture. Let us recall the celebrated saying attributed to Baronius: "*Spiritui Sancto mentem fuisse nos docere quomodo ad coelum eatur, non quomodo coelum gradiatur*" ["It was the Holy Spirit's intent to teach us how one goes to heaven, not how the heavens go"]. In fact, the Bible does not concern itself with the details of the physical world, the understanding of which is the competence of human experience and reasoning. There exist two realms of knowledge, one which has its source in Revelation and one which reason can discover by its own power. To the latter belong especially the experimental sciences and philosophy. The distinction between the two realms

2. Maurice A. Finocchiaro, ed. and trans., *The Essential Galileo* (Indianapolis: Hackett, 2008),

24. The present whereabouts of Galileo's mortal remains will be discussed later.

3. This eloquent expression comes from Gingerich, "Galileo Affair," 119.

of knowledge ought not to be understood as opposition. The two realms are not altogether foreign to each other, they have points of contact. The methodologies proper to each make it possible to bring out different aspects of reality. . . .

Thus the new science, with its methods and the freedom of research which they implied, obliged theologians to examine their own criteria of scriptural interpretation. Most of them did not know how to do so.

Paradoxically, Galileo, a sincere believer, showed himself to be more perceptive in this regard than the theologians who opposed him.⁴

The pope also refers in his address to Galileo's famous letter dedicated to Christina of Lorraine (1565–1637), the Grand Duchess of Tuscany. Christina of Lorraine was the favorite granddaughter of Catherine de Medici, the queen of France, and Christina's son Cosimo II de Medici (1590–1621) was Galileo's patron. Dedicating this letter to the Grand Duchess Christina was a very prudent move by Galileo, as discussed below. It has even been suggested that while Galileo's letter of 1615 to the Grand Duchess was indeed dedicated to her, it was never intended to be read by her. In fact, there are no records that the Grand Duchess actually read the letter.⁵

As Pope John Paul II emphasized, it was a battle for the soul of the world then, and it is a battle for the soul of the world now. What better aid for us to use four centuries later than the actual letter written by Galileo in 1615 and addressed to the Grand Duchess of Tuscany? The letter is about the harmony between the new science and faith in God. It is a letter of such significance that it does not escape mention by Pope John Paul II.

4. John Paul II, "Allocution of the Holy Father John Paul II to the Participants in the Plenary Session of the Pontifical Academy of Sciences," October 31, 1992, in *Papal Addresses to the Pontifical Academy of Sciences 1917–2002*, Pontificiae Academiae Scripta Varia, no. 100 (Vatican City: Pontificia Academia Scientiarum, 2003), 336–43.

5. We are indebted to Ottavio and Daniele Besomi, Massimo Bucciantini, Michele Camerota, and George Coyne for their insights into these aspects of the *Letter to the Grand Duchess Christina of Tuscany*.

Is There Grace in Space?

The Two Books

Galileo began his *Letter to the Grand Duchess Christina of Tuscany* as follows:

*A few years ago, as your Highness well knows, I discovered many things in the heavens which had been invisible until this present age. Because of their novelty and because some consequences which follow from them contradict commonly held scientific views, these have provoked not a few professors in the schools against me, as if I had deliberately placed these objects in the sky to cause confusion in the natural sciences.*¹

A recurring theme in this letter, and a source of great concern to Galileo, was this tension between what he observed through his telescope and the opinions of the theologians. Cherished by the theologians of the day was Aristotle's geocentric model of the universe, wherein all bodies, including the sun, orbited the earth. The earth was perceived to be the center of the universe. At the time of Galileo, the book of Scripture was used by many as the only source of truth, and the concept of a non-earth-centered world, as revealed by Nicolaus Copernicus's and Galileo's new observations, was seen as a huge threat.

The shoe is now on the other foot; to many today, the living truths are found only in the book of science, and the book of Scripture is regarded

1. Citations are omitted for quotations from Galileo's *Letter to the Grand Duchess Christina of Tuscany*, which is reprinted in full in the appendix of this book. When such quotations appear as extracts, they are italicized.

as mythological and irrelevant. Our personal horizons since the time of Galileo have completely changed. Authority has moved from the church (which so dominated everyday life in Galileo's time) to the individual. Many now choose to follow the book of science exclusively, with God beyond the fringe of their horizon. Does science not explain everything? No, there are two realms of knowledge. Everything is not science. Above all, spiritual revelation is not science. As Pope John Paul II elucidates,

There exist two realms of knowledge, one which has its source in revelation and one which reason can discover by its own power. To the latter belong especially the experimental sciences and philosophy. The distinction between the two realms of knowledge ought not to be understood as opposition.²

We refer to these two realms of truth as the two books. For us, as astronomers and Christians, the book of Scripture is the revelation of God to humanity over thousands of years. Whether one accepts these revelations is up to the individual; it depends ultimately on faith, not on bare reason, experiment, or observation (although the faith we are describing does not jettison these either). In contrast, the book of nature encompasses our transient knowledge of science, both observational and theoretical, and its goalposts are ever moving.

Galileo seems to have had a better sense of the two books than his antagonists. He was not threatened by new findings in the book of nature (which may at first appear to contradict the Bible), because Galileo did not see the Bible as a scientific textbook. He saw how progress in the book of nature enables further progress. This is not the role of the book of Scripture: that book emphasizes our place in the universe as spiritual beings and the focus of God's plan for us.

Galileo himself saw the two books as if in balance. He saw the nearby universe with his telescope, and he understood that the Scriptures are about God's relationship with man. In our time, the balance is skewed: the book of nature carries the weight, and the book of Scripture is seen as peripheral or even totally irrelevant.

2. John Paul II, "Allocution of the Holy Father John Paul II to the Participants in the Plenary Session of the Pontifical Academy of Sciences," October 31, 1992, in *Papal Addresses to the Pontifical Academy of Sciences 1917–2002*, Pontificiae Academiae Scripta Varia, no. 100 (Vatican City: Pontificia Academia Scientiarum, 2003), 342.

In the book of nature, astronomers find themselves living in a universe that is calculated to be about 92 billion (i.e., thousand million) light years across, filled with billions of stars and galaxies, in which mankind seems insignificant to many (see fig. 1). In contrast, in the book of Scripture, we see mankind sustained by God's grace (his love and undeserved favor toward us). God exists outside space and time; his love is timeless. On the one hand, the book of Scripture does not address all that we can know about space, but on the other hand, it is completely beyond the domain of science to infer that mankind has no central focus in the universe.

God's focus is on his people. The incarnation, God becoming man, is a wondrous sign of spiritual man's focal place in our vast universe. The book of nature is ever changing. As Nigel Brush explains, "From the inside, science does not provide a great deal of confidence in the accuracy and completeness of scientific truth at any one point in time. Far from providing a finished product—the truth and nothing but the truth—science is a work in progress."³

In contrast, the world of God's Spirit is not subject to any equations. The book of Scripture is a book with its own context. How can science prove or disprove the revealed grace and love of God? Our receptivity to God and to his Word is inextricably linked to the condition of our hearts as described by Jesus in Matthew 13:3–11 (ESV):

"A sower went out to sow. And as he sowed, some seeds fell along the path, and the birds came and devoured them. Other seeds fell on rocky ground, where they did not have much soil, and immediately they sprang up, since they had no depth of soil, but when the sun rose they were scorched. And since they had no root, they withered away. Other seeds fell among thorns, and the thorns grew up and choked them. Other seeds fell on good soil, and produced grain, some a hundredfold, some sixty, some thirty. He who has ears [to hear], let him hear."

Then the disciples came and said to him, "Why do you speak to them in parables?" And he answered them, "To you it has been

3. Nigel Brush, *The Limitations of Scientific Truth: Why Science Can't Answer Life's Ultimate Questions* (Grand Rapids, MI: Kregel, 2005), 8.

given to know the secrets of the kingdom of heaven, but to them it has not been given.”

Theologians in the early days of modern science were faced with a double dilemma that to some extent is still with us today. On the one hand, there is a dangerous temptation to directly invoke the hand of God when our knowledge in science is limited (the “God of the gaps”). On the other hand, most of these unsolved problems will be solved in the fullness of time, and proposing a divine solution may not in the long run be to the glory of God.

The aurora borealis, or northern lights, is a simple example (see fig. 2): in medieval Europe, before the aurora was scientifically understood, it was thought that heavenly warriors were at work; as a sort of posthumous reward, the soldiers who gave their lives for their king and their country were allowed to battle in the skies forever. There was a gap in our scientific knowledge at the time, and mythologies in the heavens were invoked. Then came a correct scientific understanding of the cause of the aurora borealis involving the sun and the magnetic field of the earth, and the necessity of those heavenly warriors disappeared.

Science is an evolving discipline. Science is never *the* truth but only a set of partial truths. This is the very nature of the scientific method. New observations and new theories develop with time. As Saint Paul writes, “We see through a glass, darkly” (1 Cor. 13:12 KJV).

The Sociology of Science

In Galileo’s situation, the discoveries of science *apparently* came into conflict with the literal interpretation of Scripture. What were the theologians to do?

Galileo articulated the problem in his letter:

Those who were expert in astronomy and the natural sciences were convinced by my first announcement, and the doubts of others were gradually allayed unless their scepticism was fed by something other than the unexpected novelty of my discoveries or the fact that they had not had an opportunity to confirm them by their own observations.

Galileo then suggested that his critics would have benefited from listening to an ancient church father:

They might have avoided this error [of prescribing the geography of the heavens] if they had paid attention to a salutary warning by St Augustine, on the need for caution in coming to firm conclusions about obscure matters which cannot be readily understood by the use of reason alone.

Saint Augustine (AD 354–430) suggested that the biblical text should not be interpreted literally if it contradicts what we know from science and our God-given reason. From an important passage in his *De Genesi ad litteram libri duodecim*, or *The Literal Meaning of Genesis* (early fifth century AD), we read,

It not infrequently happens that something about the earth, about the sky, about other elements of this world, about the motion and rotation or even the magnitude and distances of the stars, about definite eclipses of the sun and moon, about the passage of years and seasons, about the nature of animals, of fruits, of stones, and of other such things, may be known with the greatest certainty by reasoning or by experience, even by one who is not a Christian. It is too disgraceful and ruinous, though, and greatly to be avoided, that he [the non-Christian] should hear a Christian speaking so idiotically on these matters, and as if in accord with Christian writings, that he might say that he could scarcely keep from laughing when he saw how totally in error they are. In view of this and in keeping it in mind constantly while dealing with the book of Genesis, I have, insofar as I was able, explained in detail and set forth for consideration the meanings of obscure passages, taking care not to affirm rashly some one meaning to the prejudice of another and perhaps better explanation.⁴

Augustine's words resonate with us, as they did with Galileo. If the church had heeded Augustine's advice not to impose itself in matters in which it was unskilled, and if power and control had not been such

4. Augustine, *The Literal Meaning of Genesis*, trans. and ed. John Hammond Taylor, Ancient Christian Writers 41 (New York: Newman, 1982), 42–43.

a focus for the church at the time, then this long battle between the church and science may never have taken place.

Theologians failed miserably at the time of Galileo in that they misinterpreted Genesis, sprinkling their writings with what Galileo called “vain arguments.” Their opinion was that the earth was the center of the universe, and no evidence would change their mind. Gaps in knowledge of matters astronomical were attributed directly to the intervention of God or explained by appealing only to the theologians’ own interpretation of verses in the Bible. But as Galileo emphasized, these people show “a greater fondness for their own opinions than for truth.” Not even evidence through a telescope would change their minds. In a letter to Johannes Kepler dated 1610, Galileo referred to such people as stubborn “asps”:

My dear Kepler, I wish that we might laugh at the remarkable stupidity of the common herd. What do you have to say about the principal philosophers of this academy who are filled with the stubbornness of an asp and do not want to look at either the planets, the moon or the telescope, even though I have freely and deliberately offered them the opportunity a thousand times? Truly, just as the asp stops its ears, so do these philosophers shut their eyes to the light of truth.⁵

What is an asp? We found Galileo’s use of the term “asp” puzzling in the context of stubbornness. After much digging, it became clear that he was talking about a “deaf adder” (Lat. *aspis*).⁶

Serious prejudices against the book of nature often stem from those whose exposure to the scientific method is limited. To be “well grounded in astronomical and physical science” requires as much training as does psychiatry or neuroscience in the medical world. Astrono-

5. Galileo, Letter to Johannes Kepler, in *Le Opere di Galileo Galilei: Edizione Nazionale*, ed. Antonio Favaro (1890–1909; repr., Florence: Giunti Barbèra, 2013–2015), 10:423. The original Latin in this letter by Galileo reads, *Volo, mi Keplere, ut rideamus insignem vulgi stultitiam. Quid dices de primariis huius Gimnasii philosophis, qui, aspidis pertinacia repleti, nunquam, licet me ultro dedita opera millies offerente, nec Planetas, nec [crescent moon drawing], nec perspicillum, videre voluerunt? Verum ut ille aures, sic isti oculos, contra veritatis lucem obturarunt* (emphasis added).

6. According to Isidore, bishop of Seville (AD ca. 560–636), in order to protect itself from snake charmers, an asp would lie down, pressing one ear to the ground, and would curl up its tail to stop (or deafen) sound entering the other ear. The psalmist David vividly describes the scene of an asp stopping its ear in Ps. 58:4–5.

mers would be foolish to pronounce on discoveries in neuroscience or psychiatry; we have not been trained in those specialties. Galileo's letter demonstrates how crucial it is to be thoroughly grounded in astronomy before pronouncing on scientific discoveries. Paraphrasing Augustine's message rather bluntly, don't pontificate about matters that you do not understand.

Galileo's scientific discoveries were never a threat to the book of Scripture, although they were certainly perceived as being so. The book of nature can never be in conflict with the book of Scripture because both have the same author. The one book deals with the universe, the other with God and how he relates to fallen mankind, in need of grace and forgiveness. In the words of Saint Augustine, referring to the book of Scripture, "It was not the intention of the Spirit of God . . . to teach men anything that would not be of use to them for their salvation."⁷

In Galileo's situation, the issue ultimately revolved around authority. The prime agenda of those opposing him was to uphold the geocentric model of the universe as a key to maintaining the power of the church. That was their intention and design. They thus forgot the careful distinction between the realms of the two books as Augustine articulated it.

These tensions reach back to Copernicus, who, in the annals of astronomy, is remembered as the first in Renaissance times to propose a systematic cosmology in which the earth revolves around the sun. His famous treatise *De revolutionibus orbium coelestium* (*On the Revolutions of the Heavenly Spheres*), published in 1543, is often regarded as the birth of modern astronomy and the beginning of the Scientific Revolution. The telescope had not yet been invented: the instruments that Copernicus used were ancient devices like astrolabes, going back to the time of Hipparchus and Ptolemy. Copernicus studied liberal arts in Bologna, then medicine in Padua. In 1497 Copernicus was elected a canon at the cathedral of Frombork in Warmia, and in 1503 he obtained a doctorate in canon law from the University of Ferrara.

7. Augustine, quoted in *The Faith of the Early Fathers: A Source-Book of Theological and Historical Passages*, trans. W. A. Jurgens (Collegeville, MN: Liturgical Press, 1979), 3:83.

Although he was not in fact an ordained priest, he was held in high esteem by the Catholic Church, as Galileo emphasized in his letter:

They pretend not to know that its author—or rather the one who revived [a moving earth] and confirmed it—was Nicolaus Copernicus, a man who was not just a Catholic but a priest⁸ and a canon, and so highly esteemed that he was called to Rome from the furthest reaches of Germany to advise the Lateran Council under Pope Leo X on the revision of the ecclesiastical calendar.

The church had no problem with celestial measurements and observations, and even with using calculations based on Copernicus's heliocentric model, as long as it could go through the fiction of regarding them as based on a theory, so that they didn't have to face the issues raised by the apparent clash with the text of the Scriptures. This was fine, until Galileo began to promote the Copernican model as fact and forced the church's hand.

Although the scientific establishment of Galileo's day pretended to be objective and only interested in discovering the truth, Galileo perceived the presence of hidden agendas and craven ambitions. Speaking of Copernicus's *On the Revolutions of the Heavenly Spaces*, Galileo wrote,

But now that the soundness of its conclusions [a sun-centered world, as proposed by Copernicus] is being confirmed by manifest experiments and necessary demonstrations, there are those who, without even having seen the book, want to reward its author for all his labours by having him declared a heretic—and this solely to satisfy the personal grudge they have conceived for no reason against someone whose only connection with Copernicus is to have endorsed his teachings.

Galileo's observations ring true today. Just like any other field, science suffers from personal agendas and motivations that can cloud objective reason. Even today it is the personal agenda of some to discredit

8. The mistake of calling Copernicus a priest appears to have first been made by Galileo. Copernicus was, in fact, a doctor of canon law but was not ordained. See Edward Rosen, "Copernicus Was Not a Priest," *Proceedings of the American Philosophical Society* 104, no. 6 (1960): 635–61.

the work of others. Some of those held in the highest esteem by the establishment (whether in the sciences or in theology) may try to impede the work of others. Astronomers seeking to publish their research articles may encounter peers appointed by the editor of a journal who may reject an article, only to find those ideas to subsequently emerge as the peer reviewer's own. Priority in scientific discoveries makes for a riveting read. The progress of science can still be modulated by personal agendas, as it was in Galileo's day. The establishment has profound authority, as Galileo points out.

Do the Trees Move the Wind?

Human beings often bring with them great subjectivity, whether they are reading the book of nature or the book of Scripture. In Galileo's day, people hid "under the mantle of false religion and by invoking the authority of Holy Scripture." Their eyes were closed to the book of nature. The Galilean moons orbiting Jupiter implied that there were bodies moving around Jupiter and not the earth; the earth was not the center of the universe. In his letter, Galileo complained about men who use the book of Scripture to discount scientific discoveries. He spoke of those "persisting in their determination to use all imaginable means to destroy me and my works." Judgment was passed on matters scientific by scientifically ignorant theologians who delighted in exposing "heresy." Their goal was to destroy Galileo and everything that was his (including his observations), rather than to contemplate the new astronomy. The book of Scripture was their weapon. Galileo could not accept this. Science in Galileo's mind was never intended to elevate one book above the other. To Galileo, both books had their well-defined foci—as in a coin with two sides, both revealing truth.

Some scientists respond in a similar tone to other scientists who assert their faith in a living God. They fabricate a shield for their atheism out of the mantle and authority of science. The book of nature is their weapon. They use the book of nature to discount the book of Scripture: their eyes are completely shut to grace in the book of Scripture. With Galileo, we find this imbalance wrong. The book of nature was never intended to make judgments on the book of Scripture. The latter is not a scientific textbook. It is a revelation of God's relationship

to and redemptive plan for spiritual mankind. At the heart of the incarnation is grace.

Scot Bontrager eloquently pens his thoughts on grace:

Our natural abilities to discern truth about the world ceases with things invisible—lacking senses to perceive the invisible world there is no way for us to know truths that lead to our eternal beatitude—the perfection for which we were created. The most we can do through natural reason is determine what God is not, but only through discerning God’s effects in the world. To get beyond our natural limitations and progress towards our perfection (sharing in the divine nature), we need God’s help: an infusion of grace. This grace, for Aquinas, comes in the form of the Holy Scriptures, which are God’s willing self-revelation to us. Grace, specifically the grace of revelation as found in the Holy Scriptures, enables a “radical transcendence of the self.” Grace, then, is the method and means by which we can come to *know* things necessary for our perfection that we could not know by our natural reason.⁹

In his book titled *Tremendous Trifles*, the literary giant G. K. Chesterton wrote a brilliant essay named “The Wind and the Trees.” Chesterton sets the stage:

I am sitting under tall trees, with a great wind boiling like surf about the tops of them, so that their living load of leaves rocks and roars in something that is at once exultation and agony. . . . The wind tugs at the trees as if it might pluck them root and all out of the earth like tufts of grass. Or, to try yet another desperate figure of speech for this unspeakable energy, the trees are straining and tearing and lashing as if they were a tribe of dragons each tied by the tail. . . . I remember a little boy of my acquaintance who was once walking in Battersea Park under just such torn skies and tossing trees. He did not like the wind at all; it blew in his face too much. . . . After complaining repeatedly of the atmospheric unrest,

9. Scot C. Bontrager, “Nature and Grace in the First Question of the *Summa*,” *Scot Bontrager* (blog), February 1, 2010, <https://www.indievisible.org/Papers/Aquinas%20-%20Nature%20and%20Grace.pdf>; italics added.

he said at last to his mother, “Well, why don’t you take away the trees, and then it wouldn’t wind?”

The great human dogma, then, is that the wind moves the trees. The great human heresy is that the trees move the wind.¹⁰

There is the invisible world of God’s Spirit—the wind—and then there is the material world—the trees—the universe, with its stars and galaxies. Some take the view that the trees move the wind (see fig. 3); they allow science and reason to shape their perspective of God. We would argue otherwise, that the wind moves the trees.

10. G. K. Chesterton, “The Wind and the Trees,” in *Tremendous Trifles* (1909; repr., London: Methuen, 1930), 61–65.

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