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Galileo Galilei: A Christian Mathematician

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Abstract

Galileo Galilei was born on February 15, 1564 to a famous music theorist. Galileo quickly made his own name known across Europe. He worked tirelessly to not only improve his own mind but, in his eyes, that of the Church's as well. He made many significant discoveries and contributions to Mathematics, Philosophy, Physics, and Christianity. Even though his work was continually rebutted by the Church, he persevered to defend findings until his death in 1642. This paper examines Galileo's life and his life's work. It also looks at how Galileo's Christian faith encouraged his work, and how his work encouraged his faith.

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Mathematics is one of many professions that evolves with time. Sometimes it is allowed to change for the better and other times it is forced to a halt by those that do not appreciate change. Either way, these changes would not occur without the efforts of many mathematicians and their contributions to, as well as their applications of, mathematics. Upon hearing the name "Galileo" some people immediately think of an astronomer and scientist, others begin signing "Bohemian Rhapsody" by Queen. Whichever approach they take, Galileo has become a household name over many years. In observing the timeline of his life, it is clear that Galileo Galilei applied his knowledge of mathematics to slowly but surely further the scientific world and challenge the Church.

Galileo was born on February 15, 1564 in Pisa, Italy. He was the oldest son of Vincenzo Galilei, a musician "who made important contributions to the theory for practice of music" (AVH). Outside of that, little is known about his early childhood. While in his pre-teens, in 1574, the Galilei family moved to Florence. There, Galileo began to train at the Montessori school at Vallombrasa. In 1581, Galileo "matriculated" to the University of Pisa with the intention of studying medicine (AVH). However, he quickly found a love for mathematics. So instead of medicine, Galileo switched to studying math and philosophy. Ostilli Ricci, Galileo's teacher, taught Galileo by the works of Euclid and Archimedes (SparkNotes). After four years of university, due to money constraints, Galileo dropped out of university without receiving a degree. Instead, he chose to study on his own, "living as a tutor and publishing solutions to complex problems" (Christian History).

It was during this time that Galileo created the hydrostatic balance and began studying the concepts of motion. To add to this, he gained more recognition, and patronage, by

successfully delivering a lecture in which he discussed the layout of "the world in Dante's *Inferno*" (AVH). Due to rising fame and the accomplishments mentioned above, in 1589 Galileo was hired as the Chair of Mathematics at the University of Pisa.

> There, according to his first biographer, Vincenzo Viviani… Galileo demonstrated, by dropping bodies of different weights from the top of the famous Leaning Tower, that the speed of fall of a heavy object is not proportional to its weight, as Aristotle had claimed. The manuscript *De Motu* (*On Motion*), finished during this period, shows that Galileo was abandoning Aristotelian notions about motion and was instead taking an Archimedean approach to the problem. (AVH)

This, of course, caused friction with the scholars of the time, as many of them based their work off of Aristotle's. Due to the tension, in 1592, Galileo was forced to leave his position at the University of Pisa. However, as mentioned above, his recognition as a brilliant scholar was only increasing. Not long after the termination of his previous contract, Galileo secured the same position at the University of Padua. It was during this time that Galileo, based on his own observations, would write to Johannes Kepler in support of his heliocentric view of the universe. This would be the first of many letters of the same kind that would eventually lead to his downfall. That aside, this time is said to be the "happiest and most productive" time of his life (Christian History). The evidence of this statement can be seen in how much work Galileo was able to accomplish before his run in with the Roman Inquisition.

Galileo focuses most, if not all, of his efforts in studying the field of physics. By 1609 he had successfully studied many areas with in physics; including laws of motion. At this time, he also began combining his knowledge of mathematics and physics to extensively study astronomy. One of his most notable contributions and study tools of the time was the telescope.

Early in January 1610, Galileo made many discoveries using the ever-improving device. “He found mountains on the moon, saw that the Milky Way was actually composed of stars, and discovered four satellites around Jupiter, which he named the ‘Medician Stars’” (VSO).

While these were wonderful discoveries; with rising fame, comes rising opposition. In 1610, Galileo returned “in triumph to his native land” as he had just been named Mathematician and Philosopher of the Grand Duke of Tuscany (AVH). According to Virginia Stem Owens, Galileo “embarrassed Aristotelians by intervening” in the project of casting a new bell for the City Tower of Florence. She explains that Galileo used ideas from Archimedes to solve a long-standing problem the craftsmen faced (VSO). That is, he helped them develop a different casting structure, as the wooden cast was not working. Only Galileo knew it was due to a newly re-discovered law of physics: “bodies must be heavier than the volume of the liquid they displace or they will float to the surface” (VSO). Even though it contradicted Aristotle, the city officials were so grateful to the scholar that they gave a celebration in his honor.

However, this new-found fame did not overshadow the dramatic shift he was introducing in the worlds of mathematics and physics. As he published his discoveries, Galileo was bringing into question much of the work done by Aristotle and his followers. For example, “the common understanding” of the time “was that the universe was a set of nested concentric spheres, with our own planet at the center;” also known as the geocentric theory of the universe (VSO). Galileo believed otherwise. Through his research and extremely complex calculations, Galileo sided with the Copernican heliocentric view of the universe. That is, he was of the opinion that the sun, not the earth, was at the center of the universe. He was fully aware that he held the unpopular view, but was tired of hiding the fact. So, in 1613 he published the letters he traded with Father Castelli, regarding the topic, to formally take his stance on the heliocentric side of

the argument (SparkNotes). This was the first in a long line of confrontations that Galileo would have with the Roman Catholic Church.

He so strongly supported the church and wanted the same in return, that he believed he had the divine authority to prove the heliocentric view of the universe (WLW). Thus, he continued his work against the Church. In 1613, Galileo went to Rome to defend his philosophy. However, that did not aid in his case. In the same year, Galileo's teachings were declared inconsistent with the Bible, prompting the Dominican friar Tommaso Caccini to preach an entire sermon attacking the Galilean views (VSO). The back and forth between Galileo and the Church continued on for many years. Each time Galileo declared that he was only doing what he felt God was calling him to do; and each time the church rebutting that Galileo was being heretical.

Galileo not only continued to pursue the Copernican theory, he also added that the earth rotating on an axis. His growing "obsession" with the "true constitution of the universe" was driven by the fact that it was "imperative to [Galileo] that the Church accept the true (that is, Copernican) system of the universe" (WLW). On multiple occasions he was told he no longer needed to publish anything that would disprove the Bible or the Church, but Galileo continued to assert that that was not his purpose. Finally, in 1624, Galileo caught a small break. Shortly "after becoming pope, Barberini, [Pope Urban VIII,] granted Galileo permission to publish a dialogue "concerning *both* world systems" (WLW). Thus the *Dialogue Concerning the Two Chief World Systems* was published in1632. While it did address both of the systems it "clearly championed" Copernicus' theory (Christian History). Because of this, he was called back before the Roman Inquisition in 1633. There it was decided that they would create a document, on behalf of Galileo, stating that he had promised not to write about the Copernican system. Not only that, he was told to "publicly renounce his teaching and submit to house arrest" (Christian History). The

now seventy year- old man was, supposedly, forced to silence. He was seen as a secular, heretical scientist who had no authority to write on God's creation. However, that did not stop him.

Driven by his faith and desire to understand the work of his creator, Galileo continued to write and publish, even under house arrest. Because of this, Galileo is "often portrayed as a secular scientific hero who stood firm again religious bigotry" (VSO). It is usually forgotten that Galileo was not simply a mathematician, but a mathematician who worked for the glory of his creator. After using the newly improved telescope to extensively study the heavens, Galileo noticed his discoveries were not lining up with the churches' beliefs in regards to the layout of the universe. Thus, there was a battle between Galileo and the Papal Authority. Galileo did not see his work as a challenge to authority. In fact, Galileo was "sure he was the one who best understood God's creation," and that it was his calling to "teach the church to understand the true constitution of the universe – and the full scope and beauty of God's creation" (WLW). This is why he so continuously, and controversially, challenged people, not just the church, to accept the Copernican heliocentric view of the universe. He genuinely devoted himself to doing the work of God.

More important than any of his work, Galileo was a devout Christian man who stood up for his beliefs. His brilliant, God-given mind allowed him to creatively hypothesize and test theories that no one else could. Thankfully, he persevered through adversity to use his talents for God's purpose. This is an aspect of Galileo's life I hope to take with me. As a teacher, I many not always be in a place where I can openly share God's love with my students, but have the privilege to participate in small events like *See You at the Pole* and *Bring Your Bible to School Day*. I can also be involved with the youth programs at a local church. We live in a time where Christianity is challenged daily, and I want God's light to shine in my classroom. In the

Education department we learn about creating a safe and positive learning environment. I can make sure that my students know God's love, even if I can't speak it, by my actions and my [professional] relationships with them. I hope to take what I have learned from studying the life of Galileo and fight to work for God's glory, not matter the cost.

"Galileo's imprisonment and forced disavowal would surely have chilled the intellectual climate, and the entire episode constitutes one of the most ignoble chapters in the history of science"

– William Dunham, Journey Through the Genius: The Great Theorems of Mathematics

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