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LE 1360-005: Opening Diverse Doors
05-10-2012
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GALILEO GALILEI

For my final project of LE 1360-005: Opening Diverse Doors, I have chosen to report on a well-known and profound contributor to the scientific community; Galileo. The reason I have selected Galileo is quite simple. I am a current engineering student and I feel the impact that Galileo has had on the scientific community is unparalleled in modern history.

The time is the spring of 1564 and the place is Pisa, Italy. Vincenzo Galilei and Giulia Ammannati welcomed their first born child; Galileo. After a brief life in Pisa, the Galilei family moved to Florence, Italy in the year 1572.

As a young man, Galileo began to study for the priesthood at the monastery of Santa Maria di Vallombrosa, roughly 30 kilometers south of Florence, Italy. After much thought and consideration, and perhaps a little family influence, Galileo left his theology studies and enrolled at the University of Pisa where he initially studied medicine.

During his time at the University of Pisa, Galileo was able to formulate the isochronism, the relationship of movement and equal time intervals, of the modern day pendulum. His findings are based on observations made while he observed the oscillations of a chandelier. It is said that Galileo immediately returned to his residence and began experimenting with pendulums in order to further refine the thoughts he had forming in his mind. Up to this point in his education, Galileo had been purposely

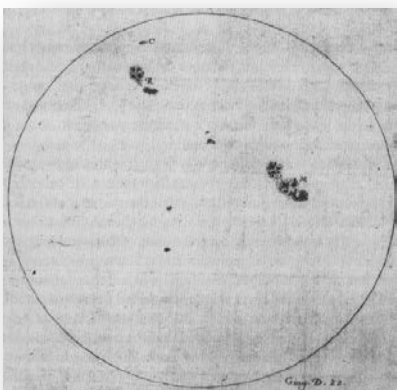


kept away from mathematics and the sciences simply due to the common knowledge that physicians earned far more than a scientist.

After attending multiple mathematics classes, Galileo's scientific mind could no longer be contained. Galileo was able to convince his father to alter his course of study and his journey into mathematics and science began. Consequently, in 1585 Galileo completed his fourth year of university studies and was unable to graduate with a degree. He returned to his family in Florence with a new found love of the scientific world and a new found curiosity that allowed him to make his mark on history.

In 1586, Galileo produced his first invention as well as his first scientific publication. Galileo invented what is known as a thermoscope. A thermoscope is equivalent to the ancestor of the modern day thermometer. His first publication was called "*La Bilancetta*," or "*The Little Balance*" and was based around what is known as a hydrostatic balance. With a hydrostatic balance, Galileo was able to describe the weight of objects in air and water; which consequently led to a better understanding of the physical properties of matter. From this point forward, Galileo became a prolific scientist and he has contributed many items and ideas to modern science.

In 1609, Galileo introduced to the world his most profound and famous invention; the Galilean telescope. During the time of this invention, a typical telescope was able to magnify objects up to three times; the Galilean telescope was able to magnify objects up to 20 times, a noticeable improvement. With the Galilean telescope, Galileo was able to make wonderful scientific discoveries. Wonderful discoveries



such as 4 moons of the planet Jupiter, observation of a supernova in deep space, celestial phases of the planet Venus, and the discovery of sunspots were all results of the Galilean telescope. One key discovery made utilizing this new telescope was the affirmation of the Copernican system. The Copernican system stated that the earth and our neighboring planets revolved around the sun. It was previously thought

that the Earth was geocentric, which means the sun revolved around the Earth; this idea of a Copernican system would lead to the condemnation of his ideas and his work.

Biblical ideas of the day stated, from biblical Scripture passages, the following: “*the world is firmly established, it cannot be moved,*” “*the Lord set the Earth on its foundations; it can never be moved,*” and “*the sun rises and sets and returns to its place.*” All of these thoughts and ideas were held in high regard by the Roman Catholic Church. These ideas of celestial science presented by Galileo, in the eyes of Rome, contradicted the Scriptures and therefore compelled Rome to ban the idea of a Copernican system.

Galileo travelled to Rome in an effort to persuade Rome to not ban the science of a Copernicus system. Unfortunately Galileo was unable to change the thought processes of the Roman Catholic Church. A decree was issued by the church declaring the ideas that the sun stood still and that Earth moved were contrary to Holy Scripture and therefore condemned. In the time of the Roman Catholic Church, any idea that was condemned could not be defended in any fashion. Galileo reluctantly chose to obey the findings and judgment of Rome.

In 1632 Galileo produced a publication known as “*Dialogue Concerning the Two Chief World Systems.*” In this text Galileo reintroduced the ideas expressed in the Copernican system. He expressed ideas that were both for and against a Copernican system. The Roman Catholic Church declared his writings as an advocacy book that supported the Copernican system and Galileo, once again, was called to Rome in order to defend his work.

In 1633 Galileo is formally interrogated by the Roman Inquisition for his writings. Galileo was unable to mount an effective defense of his “*Dialogue Concerning the Two Chief World Systems.*” A plea agreement was reached in order to spare Galileo’s quality of life, therefore affording Galileo a more lenient sentence. His sentence handed down by the Inquisition contained three essential parts:

- Galileo was found “*vehemently suspect of heresy*”, namely of having held the opinions that the Sun lies motionless at the center of the universe, that the Earth is not at its center and moves, and

that one may hold and defend an opinion as probable after it has been declared contrary to Holy Scripture. He was required to "*abjure, curse and detest*" those opinions

- He was sentenced to formal imprisonment at the pleasure of the Inquisition. On the following day this was commuted to house arrest, which he remained under for the rest of his life.
- His offending *Dialogue* was banned; and in an action not announced at the trial, publication of any of his works was forbidden, including any he might write in the future.

A popular legend tells of a moment where Galileo stood in silent defiance shortly after he was forced to recant his theory that the Earth moved around the sun. In that moment Galileo was heard to have muttered the rebellious phrase "*And yet it moves...*"

Galileo spent a brief period in Rome under the Inquisition imposed house arrest. In 1634 Galileo was allowed to return to his home where he spent the remainder of his life under house arrest. While in this state of mild incarceration, Galileo dedicated his time to the production of some of his most well-known and highly regarded publications. "*Two New Sciences*" was a work that introduced the scientific world to his research that later became known as kinematics and strength of materials.

Galileo later passed away in January of 1642. Nearly 80 years after his death, the Inquisition's ban on his scientific works was lifted. The Pope of the Roman Catholic Church authorized the publication of Galileo's complete scientific works in 1741. In October of 1992, Pope John Paul II expressed a deep and sincere regret for the way the Catholic Church handled Galileo and his ideas. The Pope issued a declaration that acknowledged the errors and misguided thoughts by the Inquisition.

Galileo will forever be one of my most important figures of history. Galileo stood up for what he felt was right. His contributions to modern science are far reaching and profound. I can only hope that my contributions to this world will have an impact like those of Galileo.