

GALILEO GALILEI (1564-1642)

1. Life.

- a. Galileo was born at Pisa on the day of Michelangelo's death in the same year as Shakespeare.
- b. Contemporaries were Montaigne, Shakespeare, Monteverdi (d. 1643), Francis Bacon.
- c. He avoided marriage but took a mistress and had three children.
- d. His faults were pride, temper, and vanity; his strengths were persistence, courage, and originality.



Justus Sustermans, *Galileo*, 1636, Florence

2. Influences.

- a. Pythagoras (d. 495 bc).
- b. Euclid (c. 300 bc).
- c. Archimedes (d. 212 bc).
- d. Nicolaus Copernicus (d. 1543).
- e. Petrus Ramus (d. 1572).
- f. Giordano Bruno (d. 1600).
- g. Johannes Kepler (d. 1630).

3. Physics.

- a. As a professor he warred against the physics of Aristotle through experiments and demonstrations.
- b. He proved that the velocity of moving bodies of the same material, of unequal weight, moving through the same medium, all moved at the same speed by dropping items from the height of the Campanile of Pisa in the presence of many teachers, philosophers, and students.¹
- c. He discovered the law of inertia (Newton's first law of motion), that a moving body will continue indefinitely in the same line and rate of motion unless interfered with by some external force.
- d. "'Only those properties of matter belong to matter that can be dealt with mathematically—extension, position, motion, density; all other properties—sounds, tastes, odors, colors, and so on—' reside only in consciousness; if the living creature were removed, all these qualities would be wiped away and annihilated.' He hoped that in time these 'secondary qualities' could be analyzed into primary physical qualities of matter and motion, mathematically measurable."²
- e. In 1638, he wrote *Dialogues Concerning Two New Sciences* concerning statics and dynamics.

¹ Vincenzo Viviani, in Will and Ariel Durant, *The Age of Reason Begins*, Kindle ed., 750.

² Will and Ariel Durant, *The Age of Reason Begins*, Kindle ed., 751.

4. Astronomy.

- a. “I esteem myself happy to have as great an ally as you in my search for truth. ... I will read your work...all the more willingly because I have for many years been a partisan of the Copernican view, and because it reveals to me the causes of many natural phenomena that are entirely incomprehensible in the light of the generally accepted hypotheses. To refute the latter I have collected many proofs, but I do not publish them, because I am deterred by the fate of our teacher Copernicus, who, though he had won immortal fame with a few, was ridiculed and condemned by countless people (for very great is the number of the stupid). I would dare to publish my speculations if there were more people like you.”³
- b. He improved the telescope until magnified objects a thousand times and discovered a new world of stars, ten times as many as had yet been catalogued.
- c. In one year, in 1610, he discovered four moons of Jupiter, the ring of Saturn, and the phases of Venus.
- d. He discovered spots on the sun.

5. Philosophy.

- a. “He had insisted on the title of philosopher as well as mathematician, for he wished to influence philosophy as well as science. He felt as Ramus, Bruno, Telesio, and others had done before him, as Bacon was urging in this same decade, that philosophy (which he understood as the study and interpretation of Nature in all its aspects) had gone to sleep in the lap of Aristotle, and that the time had come to escape from these forty Greek volumes and look at the world with loosened categories and open eyes and mind.”⁴

6. Trial.

- a. “Many theologians felt that the Copernican astronomy was so clearly incompatible with the Bible that if it prevailed the Bible would lose authority and Christianity itself would suffer. What would happen to the fundamental Christian belief that God had chosen this earth as His human home—this earth now to be shorn of its primacy and dignity, to be set loose among planets so many times larger than itself, and among innumerable stars?”⁵
- b. “Inasmuch as the Bible calls for an interpretation differing from the immediate sense of the words [as when it speaks of God’s anger, hatred, remorse, hands, and feet], it seems to me that as an authority in mathematical controversy it has very little standing. ...I believe that natural processes which we either perceive by careful observation or deduce by cogent demonstration cannot be refuted by passages from the Bible.”⁶
- c. He refused to “moderate” Copernicus.

³ Galileo, in a letter to Johannes Kepler (1596), quoted in Will and Ariel Durant, *The Age of Reason Begins*, Kindle ed., 752.

⁴ Will and Ariel Durant, *The Age of Reason Begins*, Kindle ed., 753-54.

⁵ Will and Ariel Durant, *The Age of Reason Begins*, Kindle ed., 755.

⁶ Galileo, in a letter to Father Castelli (December 21, 1613), quoted in Will and Ariel Durant, *The Age of Reason Begins*, Kindle ed., 755.

- (1) “As to the arrangement of the parts of the universe, I hold the sun to be situated motionless in the center of the revolution of the celestial orbs, while the earth rotates on its axis and revolves about the sun. ...Nature...is inexorable and immutable; she never transgresses the laws imposed upon her, or cares a whit whether her abstruse reasons and methods of operation are understandable to men. For that reason it appears that nothing physical which sense-experience sets before our eyes, or which necessary demonstrations prove to us, ought to be called in question (much less condemned) upon the testimony of Biblical passages which may have some different meaning beneath their words. ...I do not feel obliged to believe that that same God who has endowed us with sense, reason, and intellect has intended us to forgo their use.”⁷
- d. “The view that the sun stands motionless at the center of the universe is foolish, philosophically false, and utterly heretical, because contrary to Holy Scripture. The view that the earth is not the center of the universe and even has a daily rotation is philosophically false, and at least an erroneous belief.”⁸
- e. Galileo returned to Florence and kept out of controversy until 1622. In that year, he sent the manuscript of *The Assayer*, rejecting, in science, all authority but observation, reason, and experiment. “It is Galileo’s most brilliant composition, a masterpiece of Italian prose and controversial skill.”⁹
- f. In 1626, Galileo agreed to treat the subject as hypothesis.
- g. In 1632, he issued his *Dialogue of the Two Chief Systems of the World*. The dialogue form was a dodge to elude the Inquisition.
- (1) “Several years ago there was published in Rome a salutary edict which, in order to obviate the dangerous tendencies of our present age, imposed a reasonable silence upon the Pythagorean opinion that the earth moves. There were those who impudently asserted that this decree had its origin not in judicious inquiry, but in passion none too well informed. Complaints were to be heard that advisers who were totally unskilled in astronomical observations ought not to clip the wings of reflective intellects by means of rash prohibitions.”¹⁰
- h. Pope Urban VIII apportioned a commission who reported Galileo had treated the Copernican system not as hypothesis but as fact. The Jesuits claimed his doctrines were more dangerous to the Church than the heresies of Luther and Calvin.
- i. In Rome in 1633, Galileo at first refused to confess any guilt. But then, at a fourth examination, he affirmed that in 1616 “every doubt vanished from my mind, and I held and still hold Ptolemy’s opinion—that the earth is motionless and that the sun moves—as absolutely true and incontestable.”¹¹

⁷ Galileo, in a letter to the Grand Duchess of Tuscany (1615), quoted in Will and Ariel Durant, *The Age of Reason Begins*, Kindle ed., 756-57.

⁸ Edict of the Holy Office (March 5, 1615), quoted in Will and Ariel Durant, *The Age of Reason Begins*, Kindle ed., 757.

⁹ Will and Ariel Durant, *The Age of Reason Begins*, Kindle ed., 758.

¹⁰ Galileo, *Dialogue of the Two Chief Systems of the World* (1632), quoted in Will and Ariel Durant, *The Age of Reason Begins*, Kindle ed., 758-59.

¹¹ Will and Ariel Durant, *The Age of Reason Begins*, Kindle ed., 760.

- j. The Inquisition sentenced him to prison and required him to recite the seven penitential psalms daily for three years. He was free to pursue his studies, teach, write books, and receive visitors. John Milton visited him in 1638.
- k. He was a broken man, defeated and humiliated by the Church.

7. Significance.

- a. “From Brahe to Kepler to Newton and from Copernicus to Galileo to Newton are the basic and converging lines of modern astronomy.”¹²
- b. “...[N]o man since Archimedes had ever done so much for physics.”¹³
- c. Hugo Grotius called him “the greatest mind of all time.”
- d. He “widened the human mind and perspective by revealing, in greater measure than ever before, the frightful immensity of the universe. He shared with Kepler the honor of winning acceptance for Copernicus, and with Newton the distinction of showing that the heavens declare the glory of law. And, like a good son of the Renaissance, he wrote the best Italian prose of his time.”¹⁴
- e. He raised the status of science, especially in northern Europe.
- f. In 1835, the Church withdrew the works of Galileo from her Index of Prohibited Books.

Bibliography

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¹² Will and Ariel Durant, *The Age of Reason Begins*, 597.

¹³ Will and Ariel Durant, *The Age of Reason Begins*, Kindle ed., 751.

¹⁴ Will and Ariel Durant, *The Age of Reason Begins*, Kindle ed., 762.