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TIME AND SPACE
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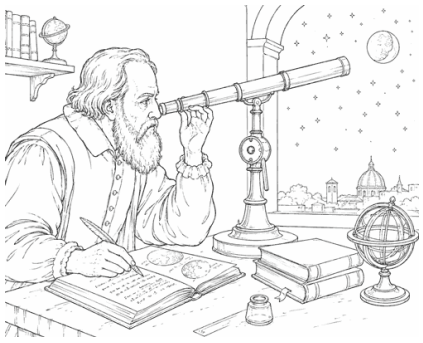
# GALILEO'S DISCOVERY

Galileo Galilei learned from observing and measuring what he saw. Galileo was from Pisa, a city on the northwestern coast of the Italian peninsula. In 1583, when Galileo was nineteen years old, he observed a priest swinging an altar lamp. No matter how wide the swing of the lamp, it seemed the time it took to move from one end to the other was always the same. Galileo recognized what scientists today call isochronism and his observations inspired the development of the pendulum clock.

## Challenging Aristotle

Galileo's interest in careful observation soon turned from motion on Earth to the study of the heavens. He had heard stories of a tool that used curved pieces of glass to magnify distant objects. In 1609, after hearing of a Dutch invention, he built his own improved version of the instrument we now call a telescope. In Galileo's time, Aristotle's idea of an earth-centered universe was widely accepted. But when the Italian scientist turned his telescope to the night sky, he began to see a universe that did not match the ideas of a Greek thinker who had lived more than 1,800 years earlier.



Aristotle is still remembered as 'the Father of Natural Science,' but in Galileo's time, his ideas were accepted as fact. He taught that heavenly bodies were perfectly round and smooth. But with his telescope, Galileo saw the rough, cratered surface of the Moon. Galileo also observed that Venus appeared to grow and shrink in a predictable pattern, much like the Moon. Galileo concluded that this would be best explained if Venus orbited the Sun rather than the Earth. Most significantly, he observed moons orbiting Jupiter. This discovery challenged Aristotle's theory that all heavenly objects revolved around the Earth.

## Conflict with the Church

Galileo began to support the ideas of Nicolaus Copernicus, who argued that the Earth and other planets orbit the Sun. While Galileo's observations did not prove this idea, they did challenge the way many people interpreted the Christian Bible. In 1616, Pope Paul V commanded that the scientist never again 'defend or hold' the idea of a heliocentric universe. Though he was a very religious man, Galileo continued to make new discoveries and to support Copernicus' theory of a sun-centered solar system.

Finally, sixteen years after he had been warned to stop supporting heliocentrism, Galileo Galilei went on trial for heresy. Heresy is an opinion or belief that disagrees with the official position of the church. Galileo was found guilty of teaching that the Sun is the motionless center of the universe. He was sentenced to house arrest for the remaining nine years of his life. Galileo accepted his sentence, but he continued to write and study from his home.

In 1992, Pope John Paul II acknowledged that the Catholic Church had made errors and, 350 years after the scientist's death, officially recognized that Galileo Galilei had been correct. Ironically, Aristotle used observation and logic to reach his conclusions—the same skills Galileo used to challenge them.

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## Fill in the Blanks

Galileo Galilei used o__s__r__a__i__n and m__a__u__e__e__t to learn about the natural world. As a young man, he noticed isochronism, the idea that a s__i__g__ng object moves at a s__ea__y rate. Later, he built an improved t__l__s__o__e and studied the h__a__e__s. At the time, Aristotle's geocentric model, which placed E_____ at the center, was widely accepted. Galileo's observations c__a__l__n__ed this view. He saw that the Moon had a r__u__h, c__a__e__ed surface and that moons orbited J__p__t__r. These discoveries supported C__p__r__ic__s' idea that the Earth and other p__a__e__s orbit the S____. In 1616, the Catholic Church warned G__l__l__o not to support this idea. In 1633, he was tried for h__r__sy and placed under h_____ a_____.

## Answer in complete sentences

1. What is isochronism?

_____

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_____

*2. Identify two ways that Galileo's observations challenged long held beliefs.

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3. Why was Galileo sentenced to house arrest?

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4. Irony is when what happens is different from what you would expect, often in a surprising or meaningful way. What was ironic about Galileo challenging Aristotle's theories?

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_____

*This is a higher order learning question. You must answer the question to the best of your ability, but any reasonable answer will be graded as correct.

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