

Background to Galileo's Letter to the Grand Duchess Christina

In 1633, at the conclusion of his trial in Rome and as a broken old man, Galileo Galilei (1564-1642), the father of modern science, renounced the sun-centered view of the universe. His book, *Dialogue on the Two Chief World Systems*, published the year before in Florence, had caused the Inquisition to suspect him of heresy. In the book, the sun-centered idea is presented as far more probable on scientific grounds than the earth-centered idea. The Catholic Church, however, as a matter of doctrine, held the sun-centered idea to be false and contrary to Scripture (the Bible), resulting in Galileo's trial, the threat of torture, and his subsequent renunciation of the sun-centered view.

For centuries, no one seemed to doubt the earth-centered view, whose particulars went back to two ancients, Aristotle and Ptolemy. In 1543, however, in his book *On the Revolutions of the Heavenly Spheres*, the Polish cleric and astronomer, Nicolaus Copernicus, resurrected the sun-centered view of another ancient, Pythagoras. Copernicus asserted that the sun-centered view offered the best explanation for the motions of the heavens. If the earth turned on its own axis, the sun and the stars would no longer have to wheel overhead every single day; if the earth and the other planets orbited the sun, the planets would no longer have to speed up, slow down, or reverse course over days or years.

Galileo, however, did not become a Copernican until he was in his mid-forties. There were important arguments against it. For example, the idea of the earth's motion contradicted direct sense experience, and the available laws of motion implied that bodies on a rotating earth would follow a slanted rather than a vertical path in free fall and would be thrown off by centrifugal force. The sun-centered view could also be considered heretical because it contradicted certain passages in the Bible. The turning point for Galileo came in 1609, when he perfected his telescope. With the telescope he could observe phenomena such as Venus and Mercury orbiting the sun. Galileo soon became a convinced Copernican.

After Galileo became a Copernican, conservative philosophers and clergymen in Florence began attacking him. They argued he was a heretic because he believed in the earth's motion and such motion contradicted the Bible. The most frequently cited biblical passage was where Joshua ordered the sun to stand still, which implies that the sun moves under normal circumstances and the earth does not. Although Galileo was aware of the explosive nature of this issue, he decided to take on the opposition by discussing how the Bible should be interpreted in light of scientific findings.

One of his responses involved writing a long letter to the Grand Duchess Christina. Christina was the Grand Duchess of Tuscany and a devout Catholic. Galileo was told that she was deeply disturbed by his support of the Copernican theory because it went against Scripture. In writing Christina in 1615, Galileo was not only addressing the concerns of a powerful patron, whose son he had tutored, but was also defending himself before other important nobles and church leaders, who would certainly hear about the contents of his letter. Galileo wanted to explain to all concerned that there was no real or necessary conflict between science and the Bible. What follows is a significant portion of Galileo's letter to the Grand Duchess Christina.