Excerpt from: Galileo Galilei (1638 /1914). *Dialogue concerning two new sciences.* H. Crew & A. de Salvio (trans.), New York: Macmillan.

SALVIATI, SAGREDO AND SIMPLICIO are discussing motion:

SALV.  …***I greatly doubt that Aristotle ever tested by experiment whether it be true that two stones, one weighing ten times as much as the other, if allowed to fall, at the same instant, from a height of, say, 100 cubits, would so differ in speed that when the heavier had reached the ground, the other would not have fallen more than 10 cubits.***

SIMP.  His language would seem to indicate that he had tried the experiment, because he says: *We see the heavier;* now the word *see* shows that he had made the experiment.

SAGR.  But I, Simplicio, who have made the test can assure you that a cannon ball weighing one or two hundred pounds, or even more, will not reach the ground by as much as a span ahead of a musket ball weighing only half a pound, provided both are dropped from a height of 200 cubits.

SALV.  But, even without further experiment, it is possible to prove clearly, by means of a short and conclusive argument, that a heavier body does not move more rapidly than a lighter one provided both bodies are of the same material and in short such as those mentioned by Aristotle…

SALV**.** If then we take two bodies whose natural speeds are different, it is clear that on uniting the two, the more rapid one will be partly retarded by the slower, and the slower will be somewhat hastened by the swifter.  Do you not agree with me in this opinion?

SIMP.  You are unquestionably right.

SALV.  But if this is true, and if a large stone moves with a speed of, say, eight while a smaller moves with a speed of four, then when they are united, the system will move with a speed less than eight; but the two stones when tied together make a stone larger than that which before moved with a speed of eight.  Hence the heavier body moves with less speed than the lighter; an effect which is contrary to your supposition.  Thus you see how, from your assumption that the heavier body moves more rapidly than ' the lighter one, I infer that the heavier body moves more slowly.

SIMP.  I am all at sea because it appears to me that the smaller stone when added to the larger increases its weight and by adding weight I do not see how it can fail to increase its speed or, at least, not to diminish it…

SALV.  …but we have already concluded that when the small stone moves more slowly it retards to some extent the speed of the larger, so that the combination of the two, which is a heavier body than the larger of the two stones, would move less rapidly, a conclusion which is contrary to your hypothesis.  We infer therefore that large and small bodies move with the same speed provided they are of the same specific gravity.

SIMP.  Your discussion is really admirable;  yet I do not find it easy to believe that a bird-shot falls as swiftly as a cannon ball.

SALV.  Why not say a grain of sand as rapidly as a grindstone? But, Simplicio, I trust you will not follow the example of many others who divert the discussion from its main intent and fasten upon some statement of mine which lacks a hairsbreadth of the truth and, under this hair, hide the fault of another which is as big as a ship's cable.  Aristotle says that "an iron ball of one hundred pounds falling from a height of one hundred cubits reaches the ground before a one-pound ball has fallen a single cubit." I say that they arrive at the same time.  You find, on making the experiment, that the larger outstrips the smaller by two finger-breadths, that is, when the larger has reached the ground, the other is short of it by two finger-breadths; now you would not hide behind these two fingers the ninety-nine cubits of Aristotle, nor would you mention my small error and at the same time pass over in silence his very large one.

Galileo apparently wrote about this question in dialogue format because he did not feel free to write directly explaining his views.  In 1632, Galileo had published *Dialogue on the Two Chief World Systems: Ptolemaic and Copernican*. In 1633, he was tried for heresy by the Holy Office of the Inquisition of the Catholic Church; his *Dialogue* was prohibited. Galileo was forced to recant his claim that the Earth was not the center of the universe, which he had claimed based on his observations with a telescope that the moons of the planet Jupiter revolved around Jupiter. He had used these observations to support his claim that the Earth moved around the Sun. He was placed under life-long house arrest. In 1638, his *Dialogue Concerning Two New Sciences* was published in Holland. Galileo died in 1642.

In 1979, Pope John Paul II called for theologians, scholars, and historians to reexamine Galileo’s case. In 1992, Pope John Paul II publicly endorsed Galileo’s support of the Copernican system, that the Earth revolves around the sun. See: October 31, 1992 news report: <http://www.nytimes.com/1992/10/31/world/after-350-years-vatican-says-galileo-was-right-it-moves.html>

Letters by Galileo’s daughter to him are located at the National Central Library of Florence Italy. For a fascinating story based on these letters, see:

Sovel, D. (1999). *Galileo’s daughter: A historical memoir of science, faith, and love*. New York: Penguin Books.