

PHYZ SPRINGBOARD

NEWTON'S FIRST LAW



THE FIRST PHYSICS

1. What was Aristotle's model of motion as he described it in his fourth century BCE book, *Physics*?

a. Describe Aristotle's elements, their hierarchy, and their characteristics.

b. Why would objects undergo "natural motion"?

c. What was "violent motion"?

d. Aristotle's model persisted for about 2000 years. What was so compelling about his model?

2. Early in the 1600s, Galileo Galilei found problems with Aristotle's physics. What were they, and how did Galileo go about demonstrating them to his contemporaries?

3. One of Galileo's conclusions was that moving bodies would continue to move as long as nothing interfered with them. This conclusion became _____ first law of motion. It states that...

SURPRISING EQUIVALENCE

4. a. The most surprising and counter-intuitive contention of the first law is...

b. Suppose you're sitting on an aisle seat in a passenger jet. You hold a coin out in the aisle and drop it. The coin lands in the aisle directly below your hand. From this you can conclude

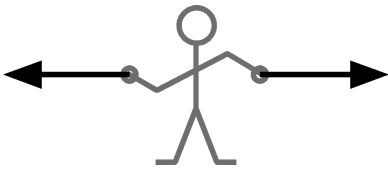
___ the jet is **at rest** on the runway.

___ the jet is **in uniform motion** flying at a speed of 600 mph.

___ neither of these: either motion described above could be happening.

c. What experiment can be conducted to distinguish rest from uniform motion?

5. a. If you are being pulled from opposite sides by equal forces, what kind of motion—if any—could you have?



b. Suppose you're traveling down the highway at 60 mph in cruise control. Which set of forces—if either—is greater: the forces pushing the car forward or the forces pushing the car backward?



EPILOG: WHO SAID IT WHEN? WHAT'D HE SAY?

6. Newton's first law was stated in his 1687 book, *Philosophiae Naturalis Principia Mathematica* (*Mathematical Principles of Natural Philosophy*). What are the sources of statements a. and b. below, and what did Alfred North Whitehead say in statement c.?

a. **"The cessation of motion is due to the opposing force.... If there is no opposing force...the motion will never stop."**

b. **"It is impossible to say why a body that has been set in motion in a vacuum should ever come to rest; why, indeed, should it come to rest at one place rather than at another. As a consequence, it will either necessarily stay at rest or, if in motion, will move indefinitely unless some obstacle comes into collision with it."**

c. "

Alfred North Whitehead (19th-20th century British mathematician and philosopher, coauthor of the 1913 book, *Principia Mathematica* with Bertrand Russell.)