

John Buridan studies a few of the major ideas which Aristotle proposes in his books on physics. In a time before standardized natural laws, much of what was known of physics was found through empirical observation and logical assumption, and Buridan has chosen to challenge Aristotle in a few areas which he believes the Philosopher did not adequately follow these guidelines.

Buridan brings a certain conundrum in which a ball is thrown, and it is asked which cause the ball to move in its arc: the thrower, or the air around the ball? At the time, it was thought to not be the thrower, because something still carried the ball after the thrower finished exerting force upon it. Nowadays, this would be explained by Kinetic Energy, but no such term existed. Aristotle makes a few point about how the air can be pushing the ball forward, which Buridan opposes. Firstly, when Aristotle suggests that the ball leaves a vacuum behind it air rushes in to fill the vacuum, the air itself pushes the ball. Buridan believes this not to be based on empirical evidence, saying, “..such a solution notwithstanding, it seems to me this method of proceeding is without value because of a number of experiences”. He then goes to cite empirical examples of how this can be seen to not happen, such as a smith’s mill, or a lance being thrown. In the case of the mill, the millstone is heavy and moves a lot, but never leaves its place, as it would if it were pushed by air. The lance wouldn’t be able to be pushed by the air because it’s so narrow, and yet it slices the air and flies very well.

Buridan also analyzes the possible explanation that the force of the throw displaces air as well, which carries the object upon a breeze, if you will. But this idea is similarly refuted by the empirical example of the forge’s mill. The forgemaster cranks it, and after he cranks it it continues to move despite not displacing any air. He also notes that a breeze strong enough to

carry a stone would be noticeable if it hit a person, and yet you can cup your hands and throw an invisible stone at someone and they won't feel a thing.

Based on these observations, Buridan reaches a number of conclusions – one of which is even a primitive precursor to the concept of kinetic energy. Third on his list of possible answers is the following: “...an impetus is a thing of permanent nature, distinct from the local motion in which the projectile is moved.” In reality, this is much more correct than the theories proposed by Aristotle. In other words, Buridan has a respect for empirical evidence, and it leads him in the right direction. He dismisses theories that can be countered by simple observation, and in doing so he eliminates countless possible theories that would lead nowhere. Much like the logic of math, where a theorem cannot be true if there is a single exception to it, physics operates in much the same way, and understanding that is a huge leap for ancient physicists.