27 Newton's laws

Subject:

1. Every body persists in its state of being at rest or of uniform motion in a straight line unless compelled to change its state by the action of an external force.

2. The change of the momentum of a body is parallel and proportional to the force acting on it.

3. The forces of two bodies on each other are always equal and are directed in opposite directions.

Deficiencies:

All of the three laws are special cases of a statement, that can be formulated in a much simpler way: Momentum cannot be created and cannot be destroyed. This is easily seen when taking into account that the quantity "force" is nothing else than the current intensity of a momentum current. Thus, Newton's laws can also be formulated in the following way:

1. The momentum of a body does not change as long as no momentum enters or leaves the body.

2. The time rate of change of the momentum of a body is equal to the momentum current flowing into or out of the body.

3. When a momentum current is flowing from a body A to a body B, the momentum current leaving A is equal to the momentum current entering B.

These corollaries of the law of momentum conservation are so simple that one would hardly attribute to them the status of theorems or laws in their own right. To convince oneself one just has to formulate the corresponding statements for another conserved quantity, or even more simply for an amount of water: "The amount of water in a container does not change as long as no water enters or leaves the container.…"

Origin:

Everybody knows the origin of Newton's laws. However, it needs a thorough analysis of Newton's work to understand why in the Newtonian system the three laws appeared as independent from each other. They are components of a complicated system of observations and definitions. Of course, Newton did not place momentum conservation at the beginning of his reflections.

Disposal:

Introduce momentum at the very beginning of the mechanics classes as a quantity in its own right, as a measure of the "amount of motion", or in more colloquial terms, "drive" or "impetus". When the momentum of a body changes, do not say, "a force is acting on it", but "momentum is flowing into it (or out of it)". This way of speaking is unusual for an experienced physics teacher. For the beginner, however, it is easier, since it avoids some of the complications that the discussion of Newton's laws, especially the third law brings with it.

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