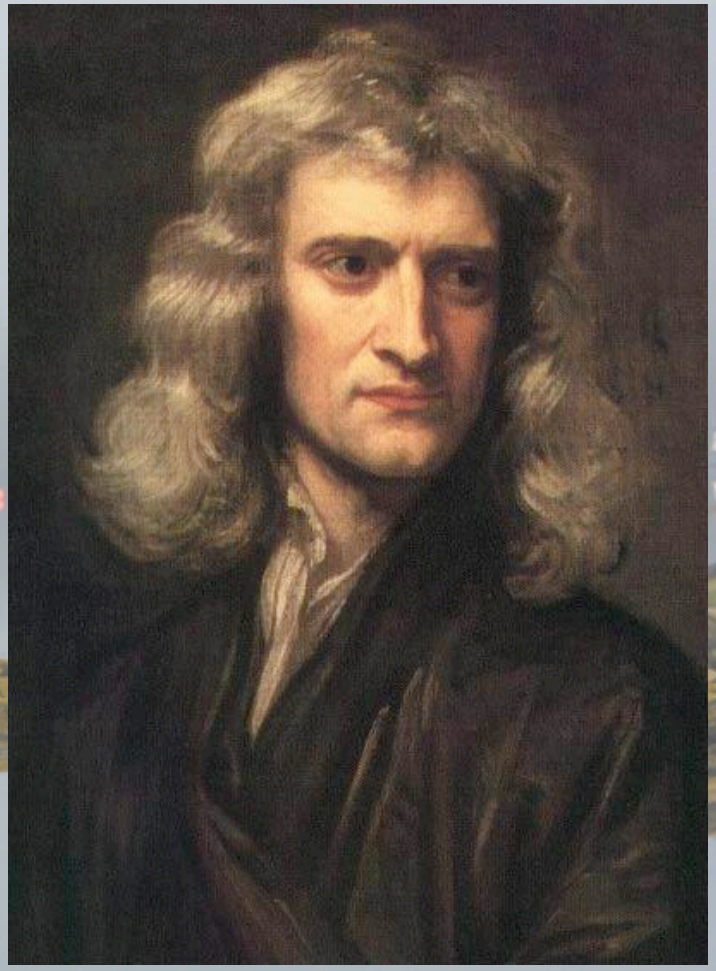
The three axioms of Sir Isaac Newton (1687)

Lex I. Corpus omne perseverare in statu suo quiescendi vel movendi uniformiter in directum, nisi quatenus a viribus impressis cogitur statum illum mutare.

Lex II. Mutationem motus proportionalem esse vi motrici impressae, et fieri secundum lineam rectam qua vis illa imprimitur.

Lex III. Actioni contrariam semper et aequalem esse reactionem: sive corporum duorum actiones in se mutuo semper esse aequales et in partes contrarias dirigi.



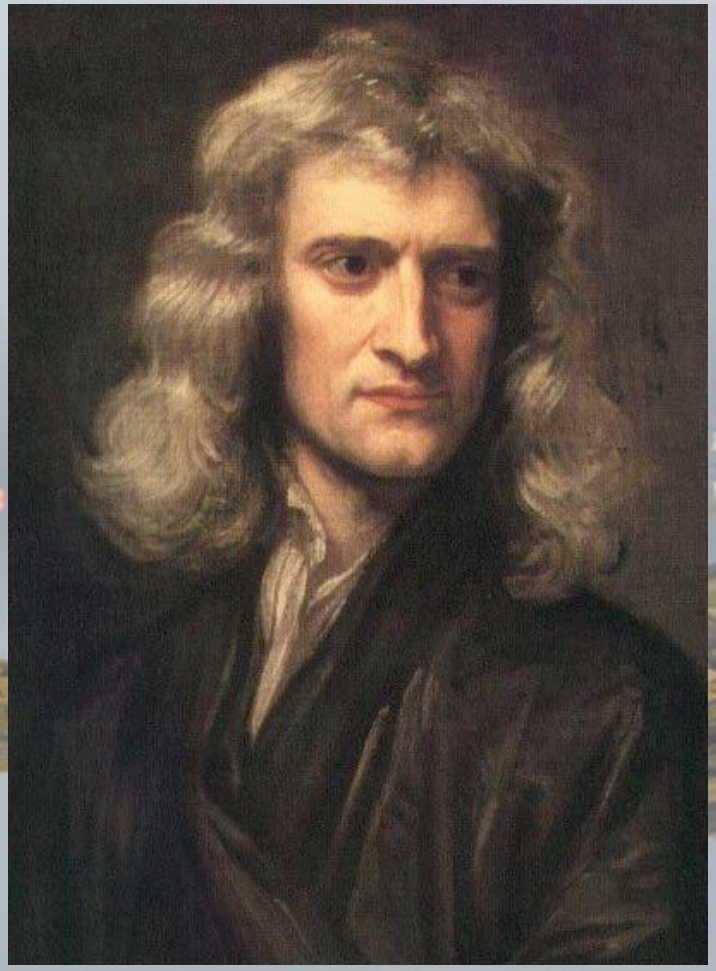
1643 – 1727

… as translated by Andrew Motte (1729)

1. Every body perseveres in its state of rest, or of uniform motion in a right[1] line, unless it is compelled to change that state by forces impressed thereon.

2. The alteration of motion[2] is ever proportional to the motive force impressed; and is made in the direction of the right line in which that force is impressed.

3. To every action[3] there is always opposed an equal reaction[3]: or the mutual actions of two bodies upon each other are always equal, and directed to contrary parts.



[1] *straight* [2] *momentum* [3] *force*

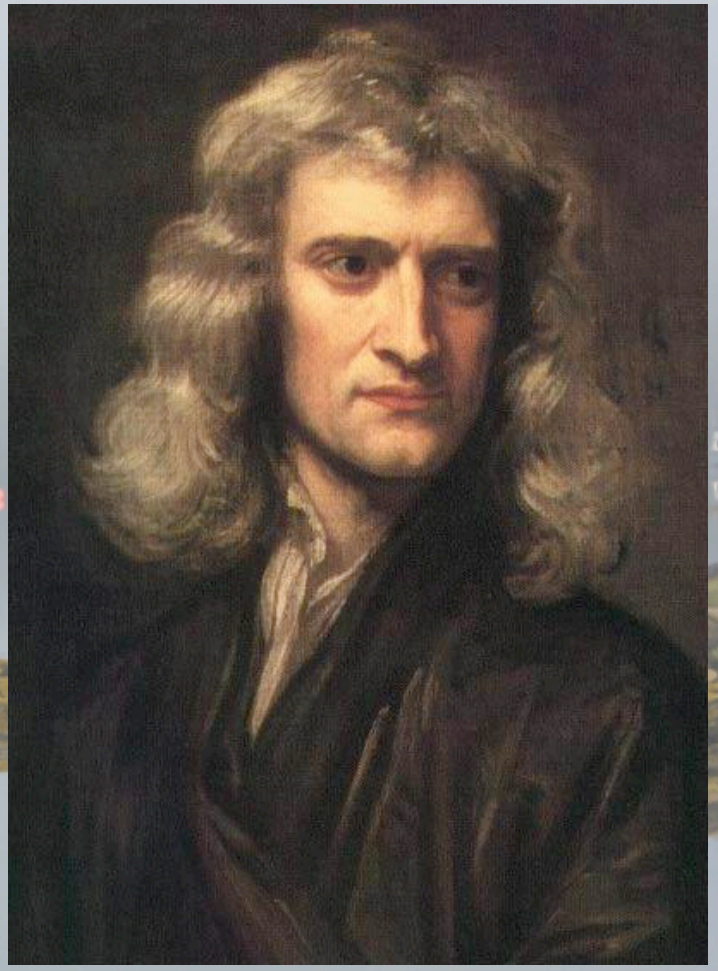
… and one of many modern translations

1. In the absence of external forces, an object moves with a constant velocity.

2. The net force on an object is equal to the time-rate-of-change of its momentum.

$$\vec{F}_{\text{net}} = \sum \vec{F} = \dot{\vec{p}} \quad \text{where} \quad \vec{p} = m\vec{v}$$
$$= m\vec{a} \quad \text{for } m = \text{constant}.$$

3. When two bodies interact, the forces exerted by each body on the other are equal in magnitude, opposite in direction.



For every action, there is an equal and opposite reaction.