

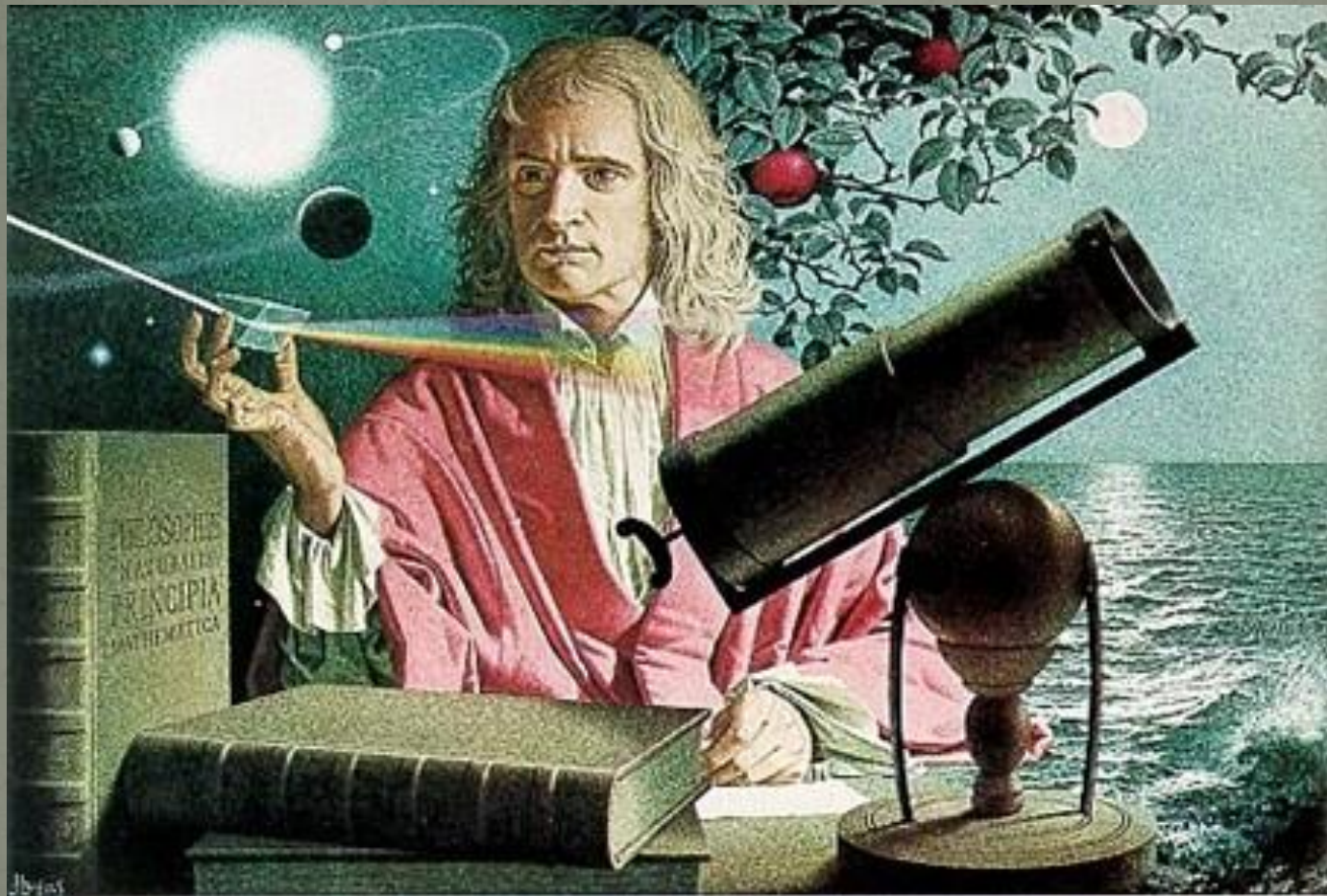
*«Не знаю, чем я могу  
казаться миру, но самому  
себе я кажусь мальчиком,  
играющим у моря, которому  
удалось найти более  
красивый камешек, чем  
другим, в то время как  
великий океан истины  
расстилается передо мной  
неисследованным»*

Александр Поп (английский поэт) так выразил свое восхищение теорией, созданной этим ученым, в стихах (перевод С. Я Маршака):

There was this world? Deep darkness  
is enveloped.? Yes there will be  
light!? And here it was .....



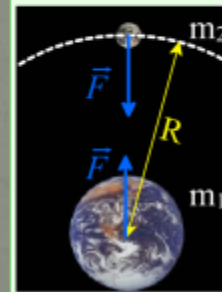
# BY THE LAW OF NEWTON



# The law of universal gravitation



$$F = G \frac{m_1 \cdot m_2}{R^2}$$



$F$  - сила взаимного притяжения  
двух массивных тел [ Н ]

$G$  - гравитационная постоянная  
[  $\approx 6,673 \cdot 10^{-11} \text{ Н} \cdot \text{м}^2/\text{кг}$  ]

$m_1, m_2$  - массы взаимодействующих  
тел [ кг ]

$R$  - расстояние между  
взаимодействующими телами [ м ]







FUNDAMENTAL  
LAWS  
MECHANICS

# LAWS OF NEWTON

1

The First Law

2



НьютоН.pptx  
The Second Law

3

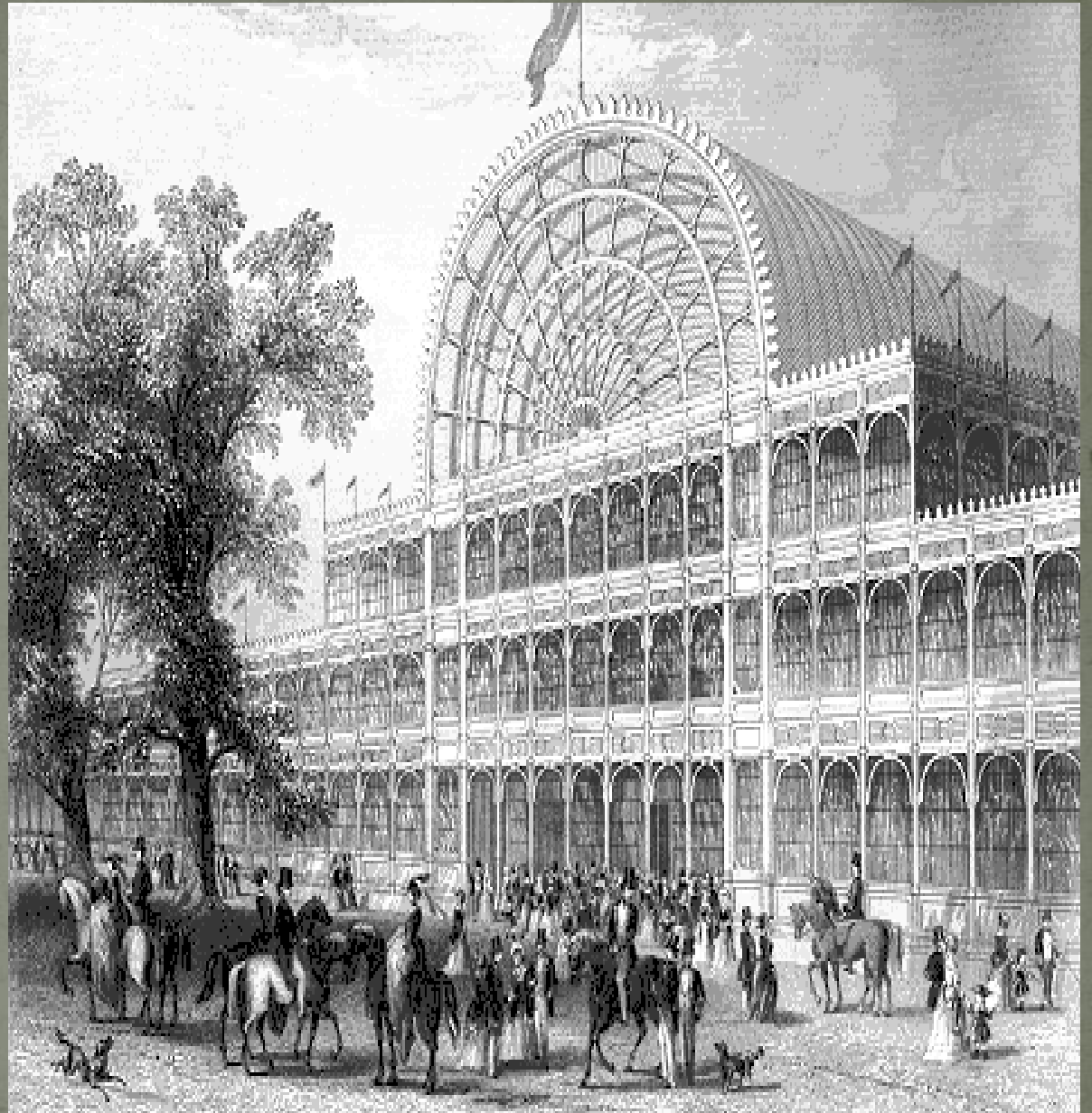
The Third Law

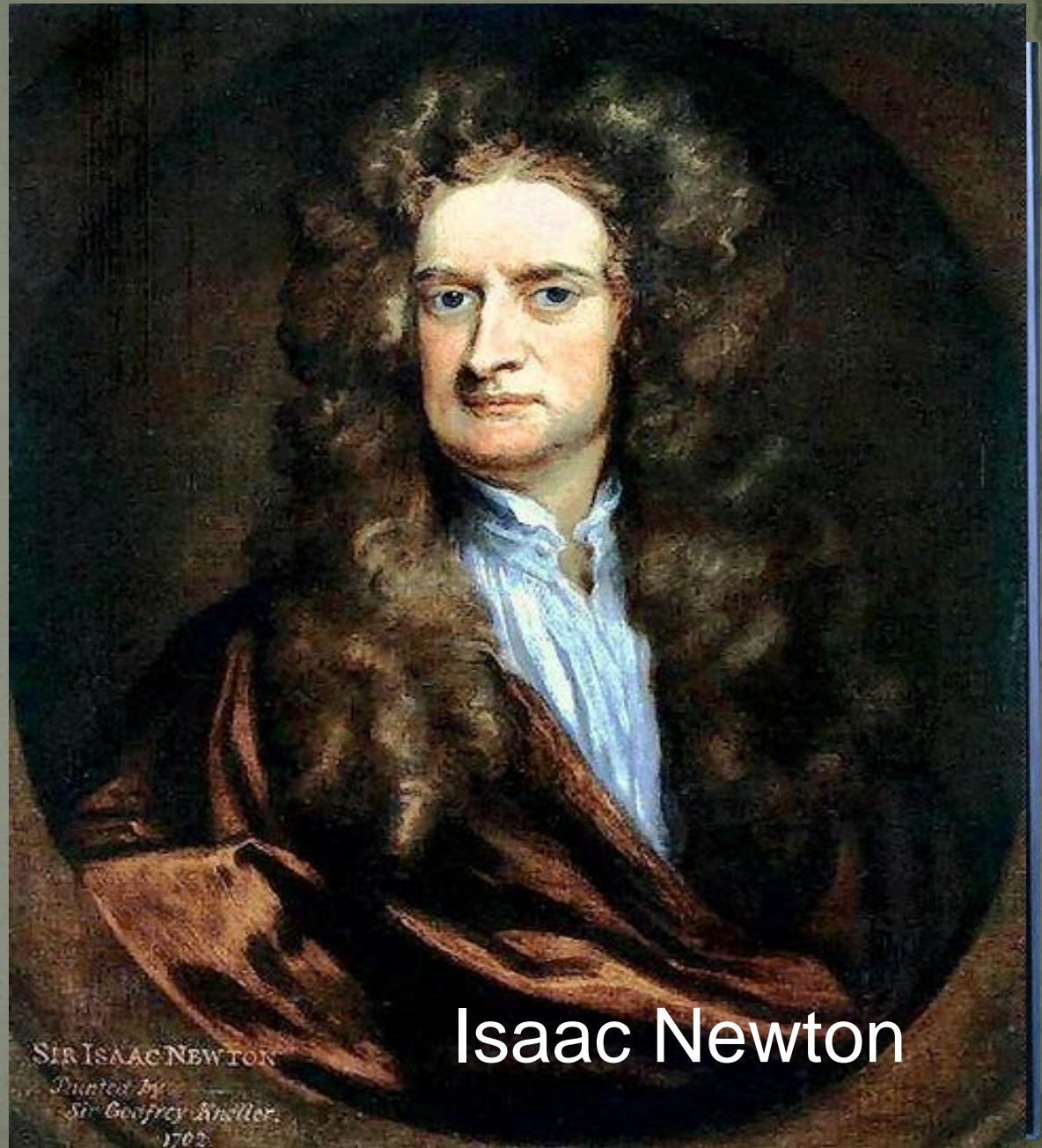
Гражданская война и Славная революция были результатом существенных перемен в жизни Англии в 17 веке. Сын казнённого короля Карл II был возвращён на престол, республика прекратила своё существование. Начала развиваться торговля, финансисты создали Английский Банк ( первый банк в мире).





- These events served the development of scientific thought in England. The Scientific Royal Society was founded, which became an important scientific center.





Isaac Newton





- Isaac Newton was one of the greatest scientists in the world. He conducted research in mathematics, physics, astronomy and many other areas.





Ньютон родился 25 декабря 1642 года ( по новому стилю 4 января 1643 года). Его отец был богатым фермером. За три месяца до рождения Исаака отец умер. Мать вышла второй раз замуж , когда мальчику было 3 года. С этого времени Исаак Ньютон воспитывался у бабушки.





- On June 5, 1661, at the age of 17, he entered the College of the Holy Trinity at the University of Cambridge as a sub-accountant (the so-called poor students who performed the duties of servants in college to earn money), and a year later he was discovered by Newton's binomial.

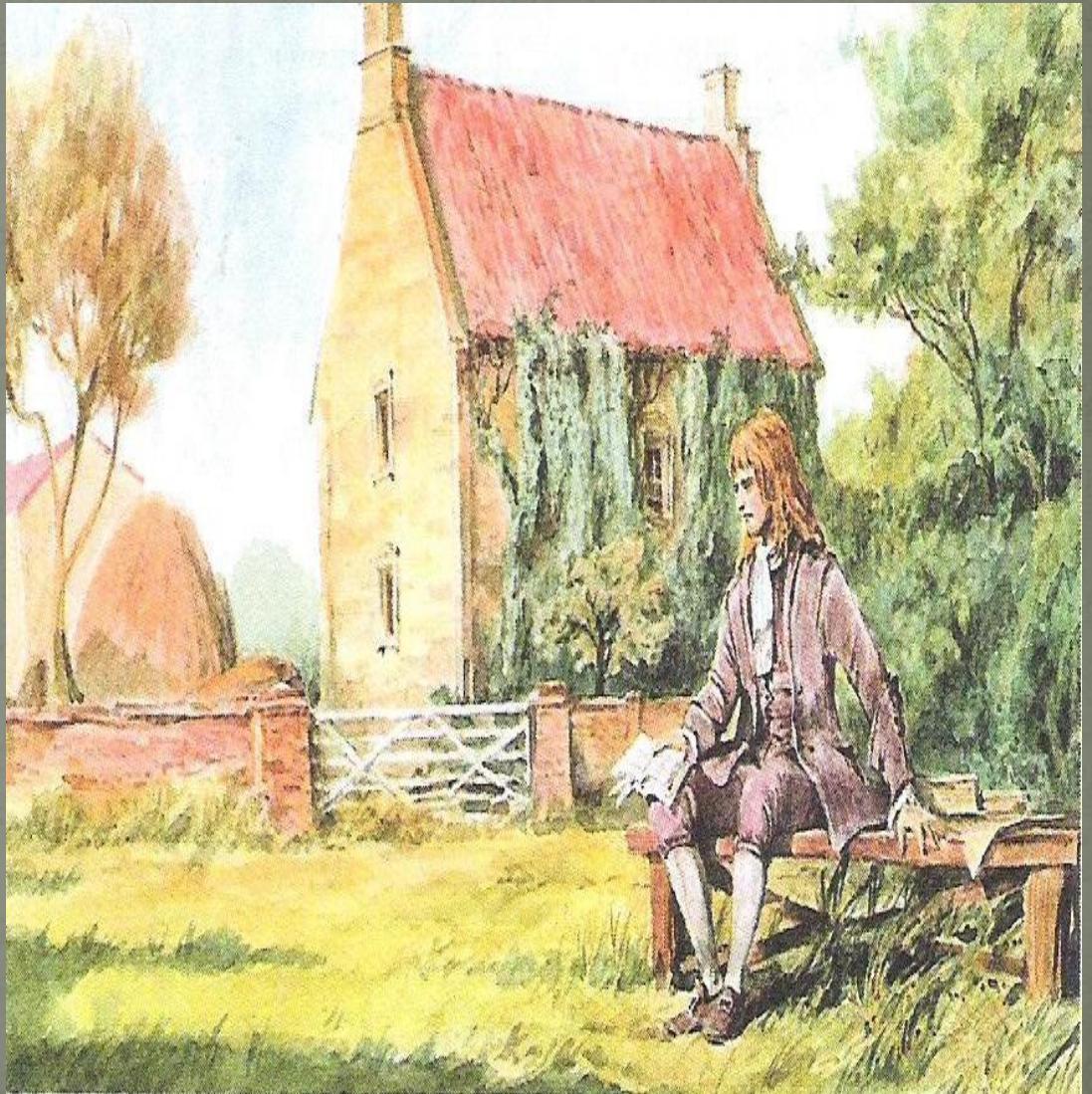


- Here in Cambridge, he made many of his scientific discoveries, and became a professor at the age of 27.



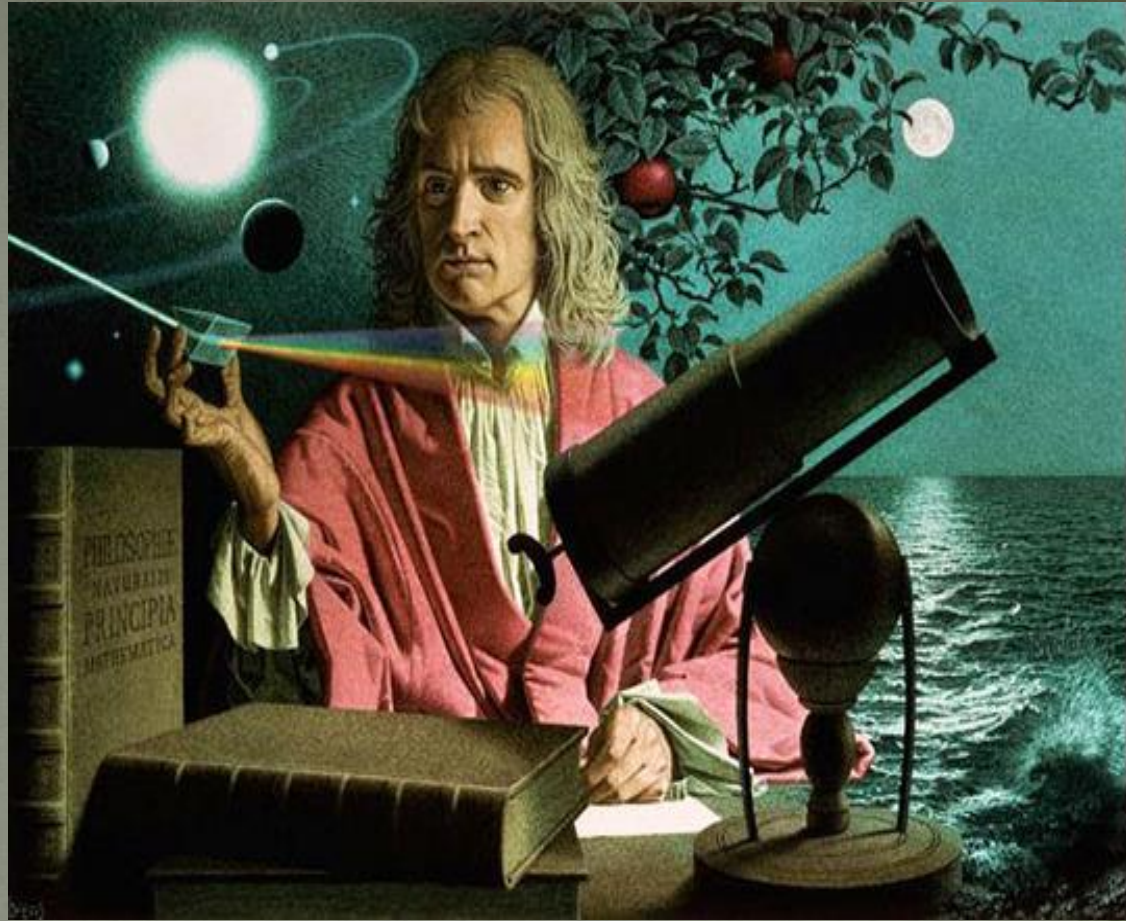


He became world famous when he discovered the law of universal gravitation. According to legend, this happened when Newton saw the falling apple from the tree.





- Newton was an astronomer who studied the Earth, planets and stars. According to his theory of gravity, the apple was pulled to the surface of the Earth in exactly the same way as the Earth reaches the sun. He argued that the planets move around the sun in ellipses.





He also conducted experiments with light and learned that normal light is made up of many colors. He used prisms to break light into a rainbow of flowers. Newton invented a new kind of telescope, in which he used lenses. This allowed the objects to look bigger.







He was proud of the whole  
of Europe. Queen of  
England Anna made Knight  
Knight in 1705 for his  
scientific discoveries.



- Исаак Ньютон никогда не был женат. Свои последние дни он провёл недалеко от Винчестера. Умер учёный в ночь с 20 на 21 марта в 1727 году и был похоронен в Вестминстерском Аббатстве.





На могиле Ньютона написаны слова: «Пусть смертные радуются, что существовало такое украшение человеческого рода».

Учёные мира считают Исаака Ньютона величайшим гением человечества.



Giles Farnaby was a popular music composer on the harpsichord of the times of Isaac Newton. Newton was interested not only in science, he loved music, poetry. And maybe at concerts he also listened to the music of Giles Farnaby.

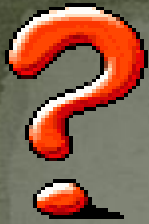


Giles  
**FARNABY**  
(1562-1640)

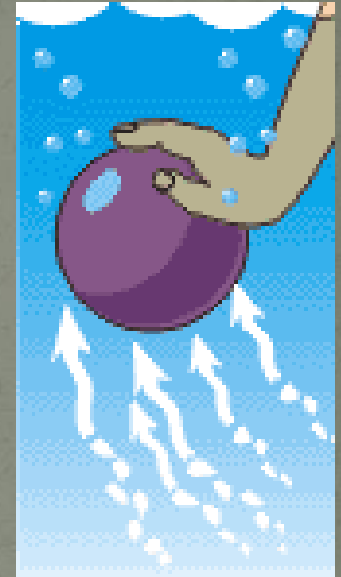
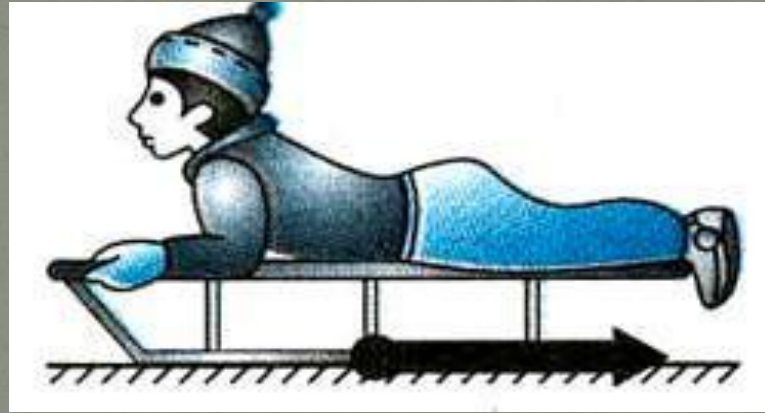
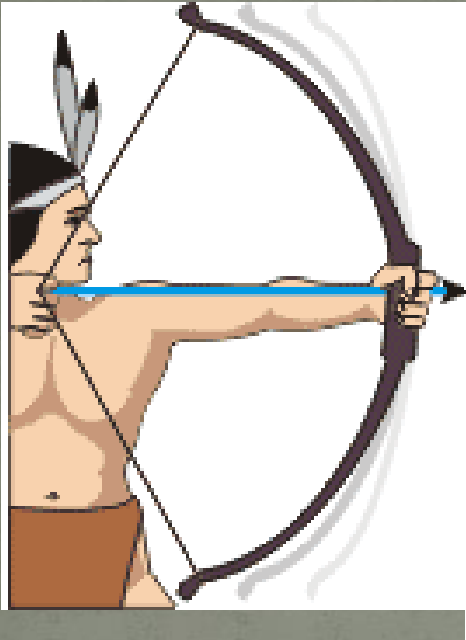
**Complete  
Fantasias  
for  
Harpsichord**

**Glen Wilson**

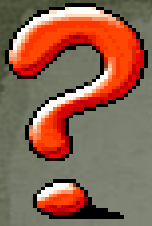




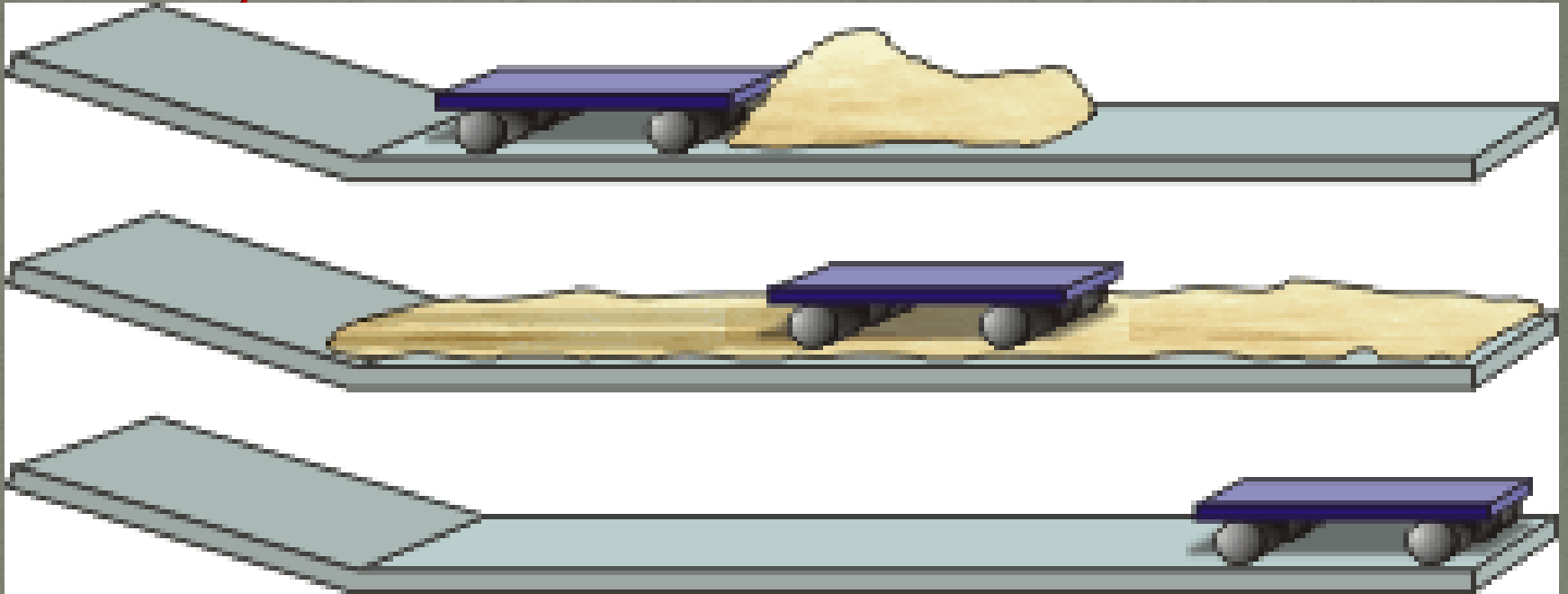
# *Как можно изменить скорость тела?*



The speed of the  
body changes,  
if it is  
operate  
other bodies !!!

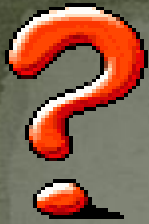


How does the change in the speed of the body depend on the magnitude of the action of another body?

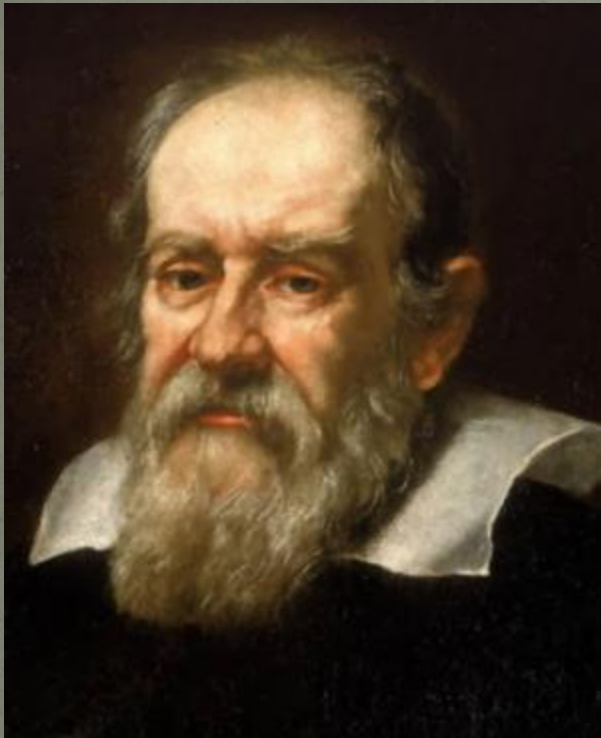


The less the action of another body, the longer the speed of movement remains and the closer the movement to the uniform !!!





How will the body move if other bodies do not act on it?



Galileo Galilei  
(1564 – 1642)

Experimentally established:  
If other bodies do not act on the body,  
then it is either at rest,  
or moves rectilinearly and evenly  
relative to the Earth.

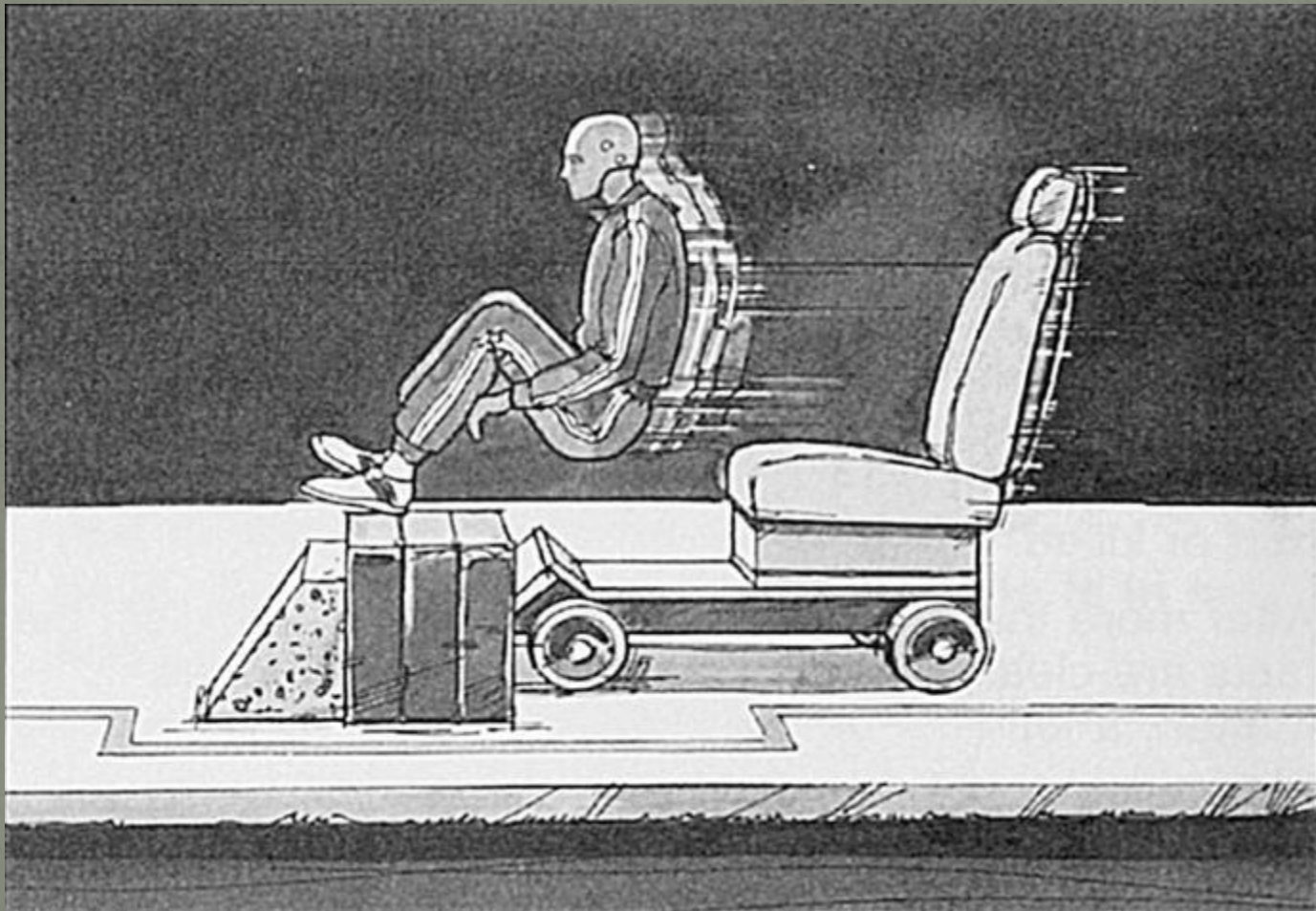
The phenomenon of conservation  
body speed  
in the absence of action  
other bodies on it  
called **inertia**

1. The driver of the minibus saw a car standing on the road, pressed the brakes, but did not escape the collision. Explain, why?





2. Explain the purpose of the seat belts in the car.



3. What will happen to the rider, if the horse, jumping over the obstacle, stumbles?





4. What happens if a person descends from the asphalt to a slippery ice?

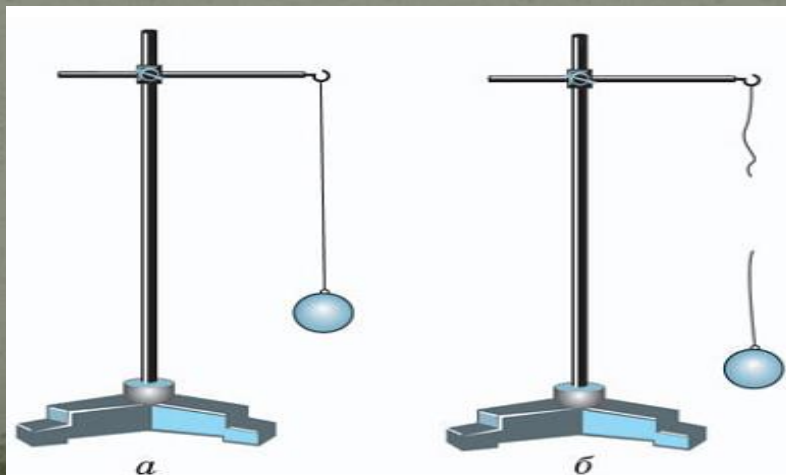


# The First Law of NEWTON

There are such frames of reference, with respect to which the translationally moving body keeps its speed constant,

If other bodies do not act on it

or the action of other bodies is compensated





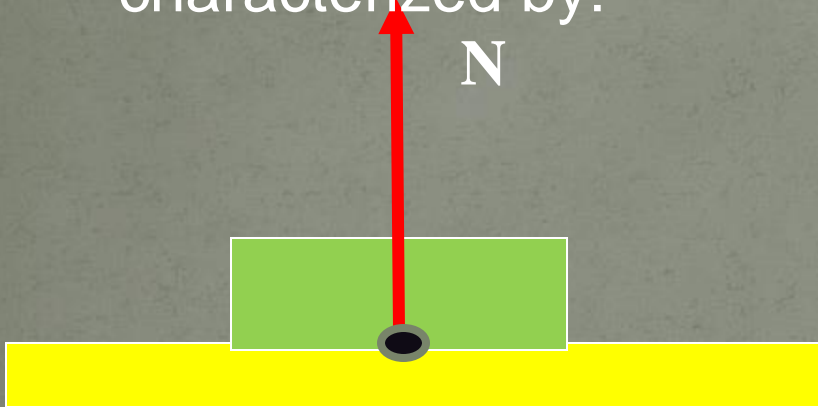
# FORCE

Force is the cause of acceleration

The strength is characterized by:

- the point of application
- direction
- force module

N



Equal force



$$\bar{R}_{1,2} = \bar{F}_1 + \bar{F}_2$$



$$\bar{F}_1 = -\bar{F}_2$$

# Newton's second law

Acceleration, which receives a body under the action of force, is directly proportional to this force and inversely proportional to the mass of the body on which this force acts

$$\vec{a} = \frac{\vec{F}}{m}$$

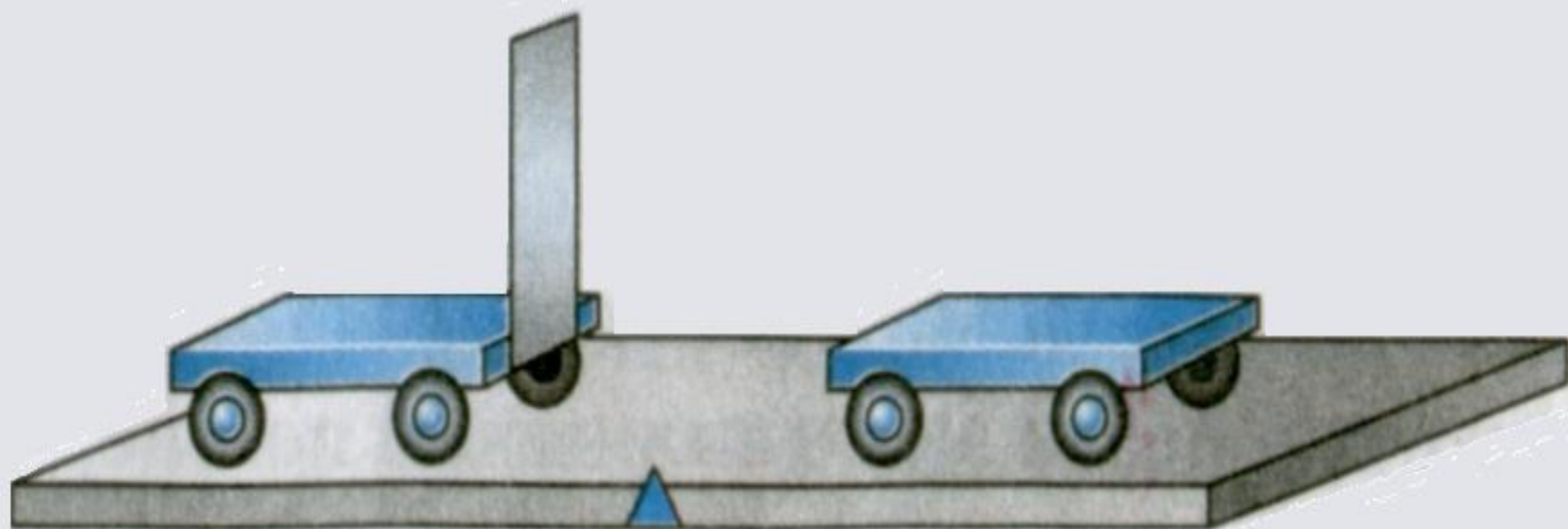
$\vec{a}$  – ускорение тела, м/с<sup>2</sup>  
 $\vec{F}$  – сила, действующая на тело, Н  
 $m$  – масса тела, кг

$$\vec{F} = m \cdot \vec{a}$$

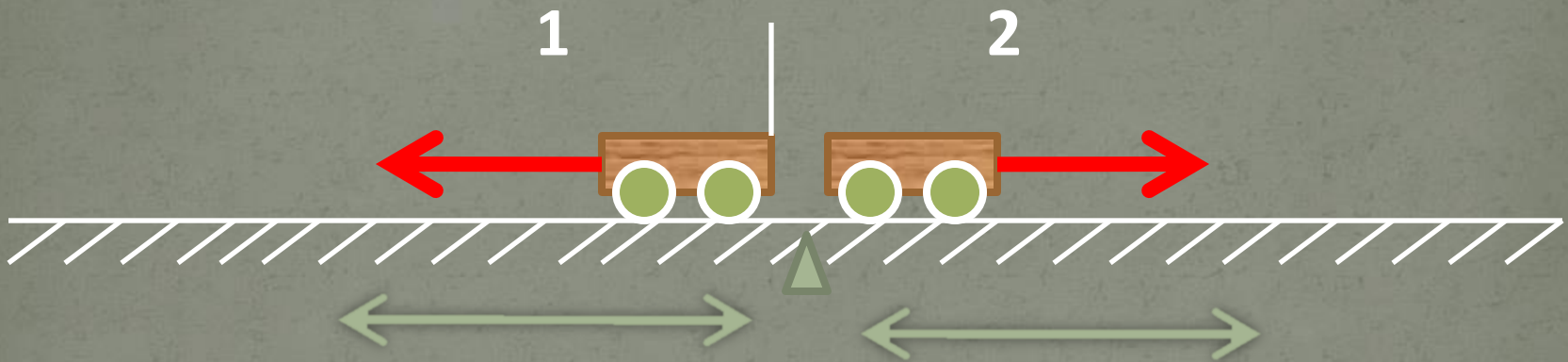
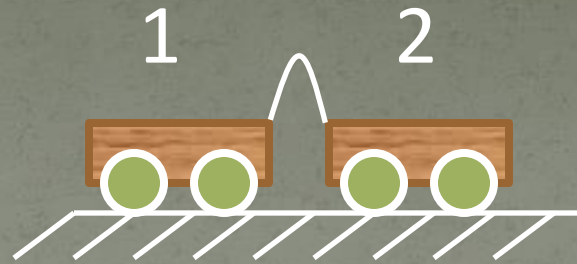


## Features of Newton's second law

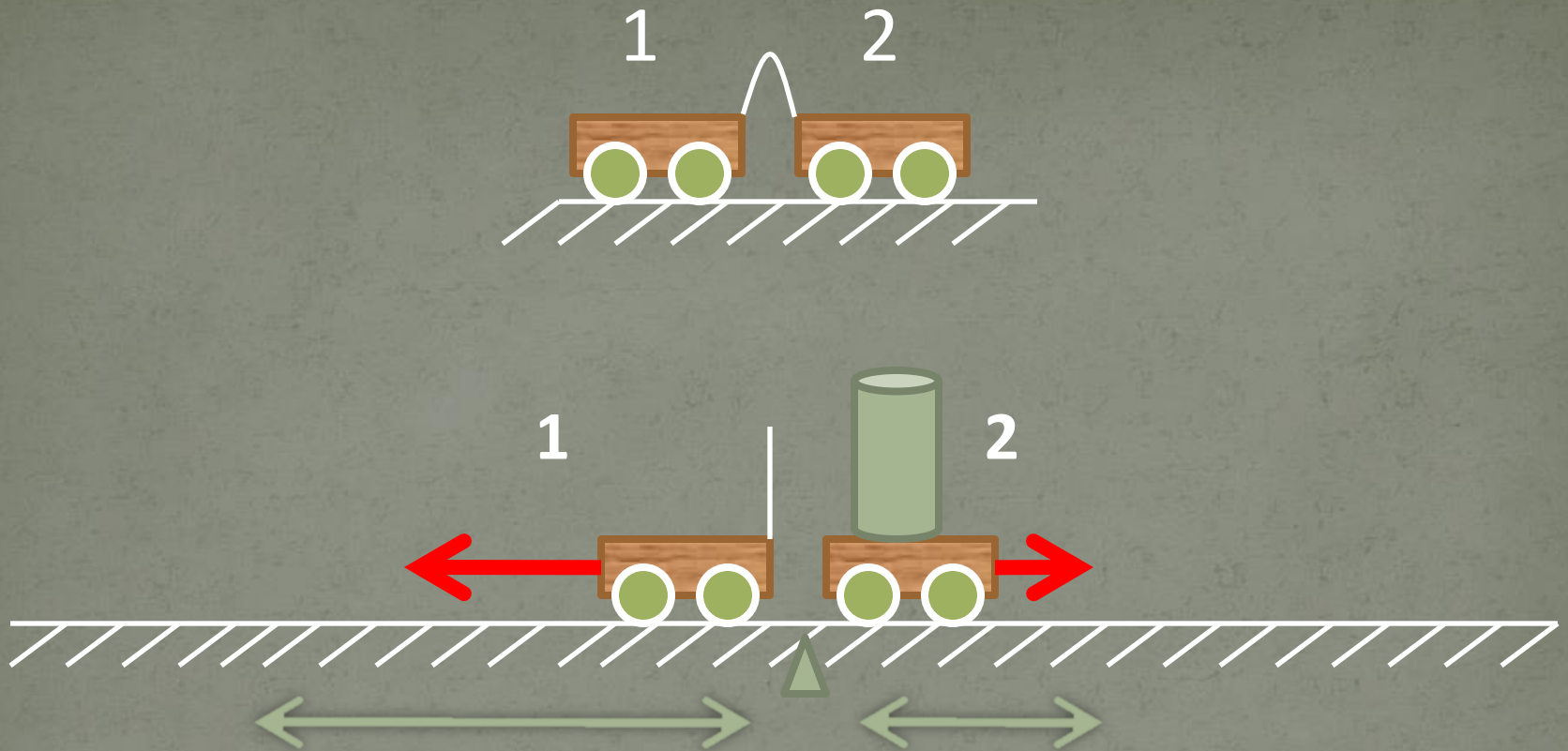
1. For any forces in nature
2.  $\vec{F}$  – cause  $\vec{a}$   
 $\vec{F}$  – determines the  $\vec{a}$
3. Vector  $\vec{a}$  co-directed  $\vec{F}$
4. If several forces act on the body, then the resultant is taken, which according to II Newton's law  $\vec{R} = m\vec{a}$
5. If  $\vec{R} = 0$ , then  $\vec{a} = 0$







The trolleys acquired the same speed. The masses of the bogies are the same.

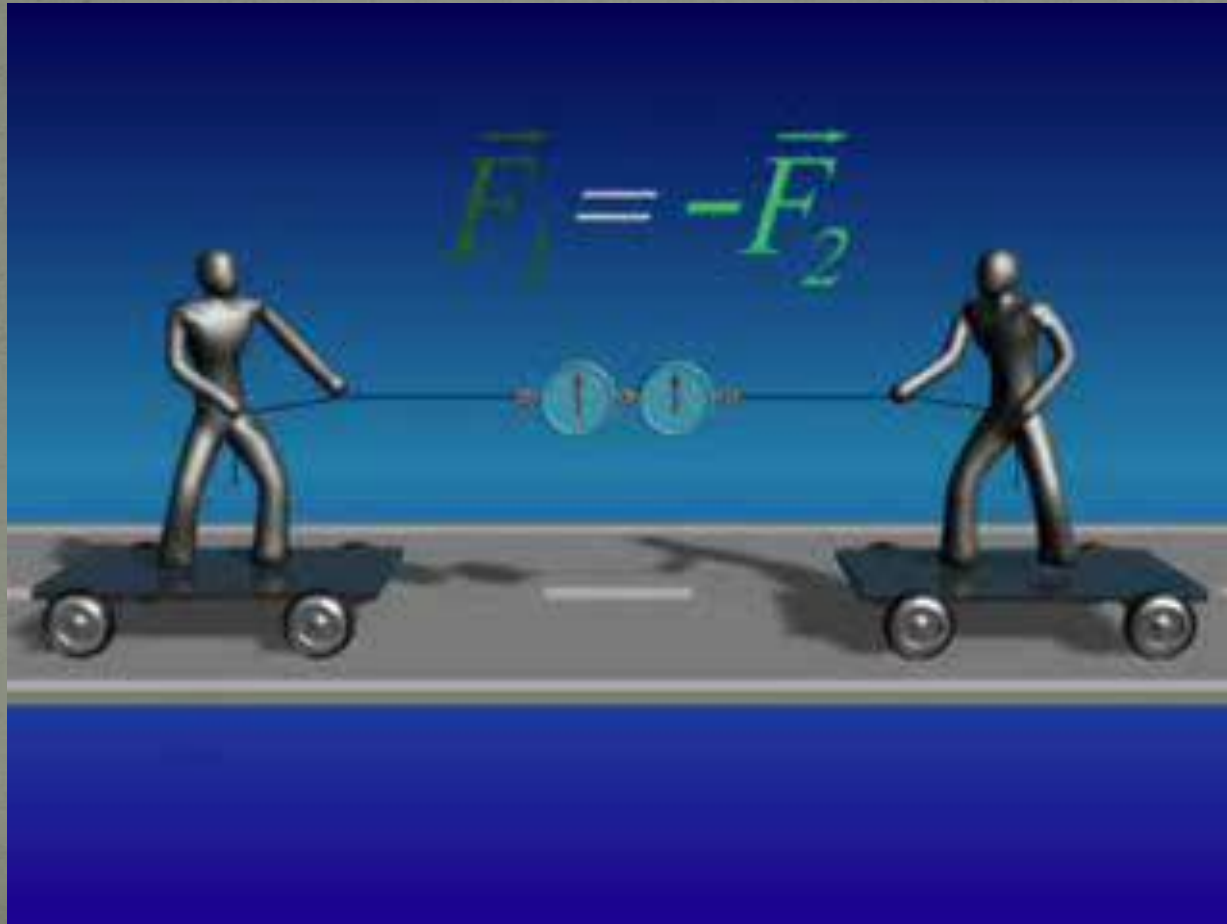


The right trolley after the interaction has acquired a lower speed. She has more mass, more inert.



# Newton's third law

The bodies act on each other with forces equal in magnitude and opposite in direction.



# Features of Newton's third law

- for a pair of forces
- only at interaction
- of one nature
- not balanced
- for forces of any nature



# Physical Exercise



# The Mongolian Tale "Wise kid".



Why did he "fly to the ground"?



V.M. Garin.  
Frog traveler.



Why did the frog fall to the ground in the wrong place over which it began to fall?

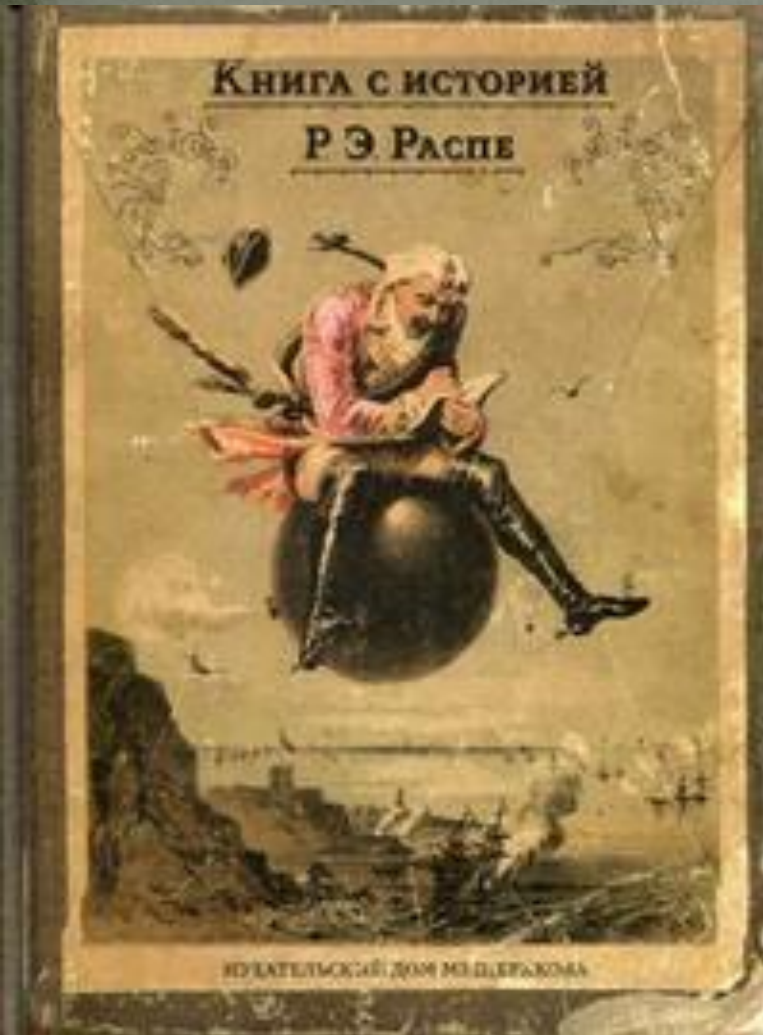
E. Raspe.  
The Adventures of Baron  
Munchausen.



Justify the impossibility of this.



# Solve the problem!



With what acceleration did the core emerge from the gun, if the mass of the nucleus is 20 kg, and the force acting on the core is 300 N.?

# Decision

- $a = F/m = 300 \text{ Н} / 20 \text{ кг} = 15 \text{ м/с}^2$





Solve the problem!

- Which way will the vacuum cleaner move?  
What is the resultant of the forces of Baby and Carlson?

# Decision

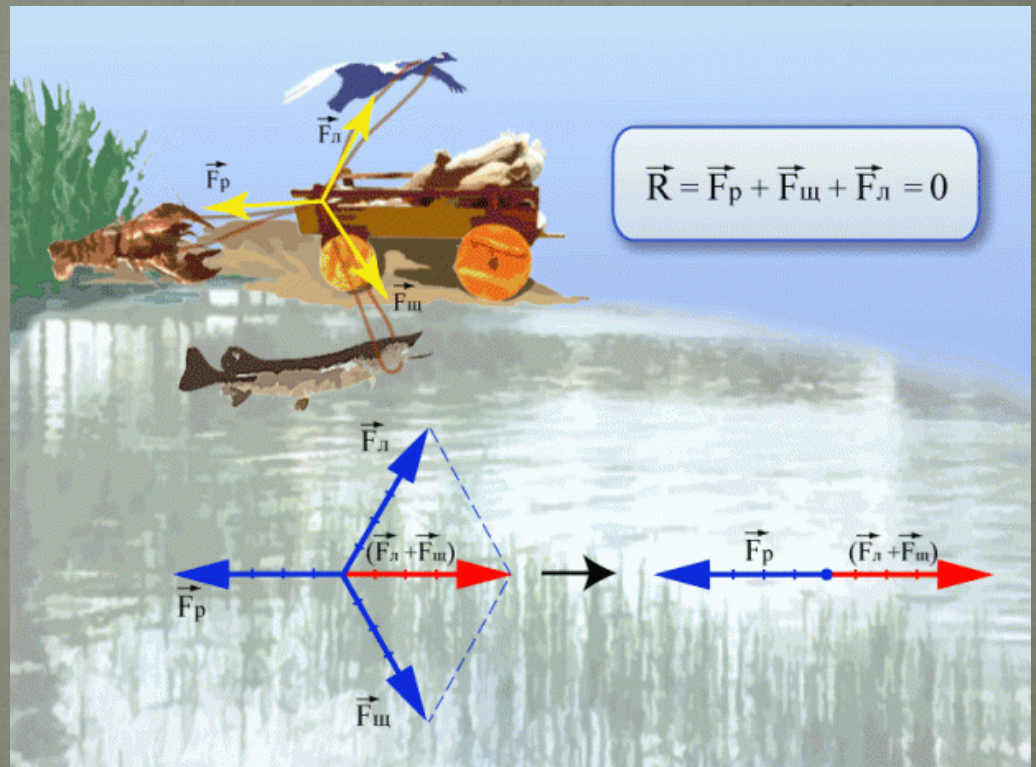
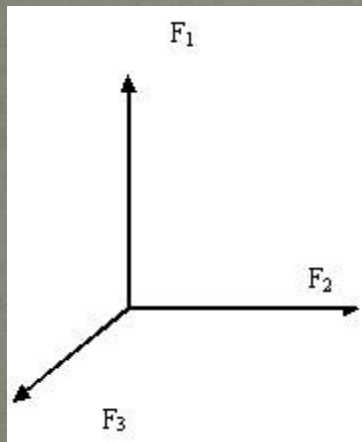
- $R = F1 - F2 = 30H - 28H = 2H,$
- towards Carlson



# Solve the problem!

Look at the picture.

# What fable was illustrated by physicists?





Isaac Newton

«I did what I could, let others do better»  
«Сделал, что мог, пусть другие  
сделают лучше»